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## ORIGINAL ARTICLES.

### THE NATURE OF THE GERMICIDAL CONSTITUENT OF BLOOD-SERUM.<sup>1</sup>

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As early as 1872, Lewis and D. Cunningham<sup>2</sup> demonstrated the fact that bacteria injected into the circulation rapidly disappear. In the blood of twelve animals that had been treated with such injections, bacteria could be found after six hours in only seven. Of thirty animals, bacteria were found after twenty-four hours in the blood of only fourteen, and of seventeen animals, bacteria were found in only two when the examination was made from two to seven days after the injection.

In 1874, Traube and Gschiedlen<sup>3</sup> found that arterial blood, taken under antiseptic precautions from a rabbit into the jugular vein of which one and one-half c.c. of a fluid rich in putrefactive germs had been injected forty-eight hours previously, failed to undergo decomposition for months. These investigators attributed the germicidal properties of the blood to its ozonized oxygen. Similar results were obtained by Fodor<sup>4</sup> and by Wysokowicz.<sup>5</sup> The latter accounted for the disappearance of the germs, not by supposing that they were destroyed by the blood, but that they found lodgment in the capillaries.

The first experiments made with extra-vascular blood were conducted by Grohmann<sup>6</sup> under the direction of A. Schmidt in his researches upon the cause of coagulation. It was found that anthrax-bacilli, after being kept in plasma, were less virulent, as was demonstrated by their effect upon rabbits. Grohmann supposed that in some way the bacteria were influenced by the process of coagulation.

In 1877, Fodor<sup>1</sup> made a second contribution to this subject, and in this he combated the retention-theory of Wysokowicz. One minute after the injection of one c.c. of anthrax-culture into the jugular vein, in eight samples of blood, Fodor found only one colony of the bacillus. Then he took the blood from the heart with a sterilized pipet and added anthrax-bacilli to it. This was kept at 38° C., and plates made from time to time showed a rapid diminution in the number of germs; after a time, when the blood had lost its germicidal properties, the number of germs began to increase.

In 1888, Nuttall,<sup>2</sup> working under the direction of Flügge, used defibrinated blood taken from various species of animals, rabbits, mice, pigeons, and sheep, and found that this blood destroyed the bacillus anthracis, bacillus subtilis, bacillus megaterium, and staphylococcus pyogenes aureus, when brought in contact with them. He also confirmed the further finding of Fodor that after a while the blood loses its germicidal properties and becomes a suitable culture-medium in which the germs grow abundantly.

Nissen<sup>3</sup> continued this work under Flügge's direction and reached the following conclusions:

(1) The addition of small quantities of sterilized salt-solution or bouillon to the blood does not destroy its germicidal properties.

(2) Cholera-germs and Eberth's bacilli are easily destroyed by fresh blood.

(3) For a given volume of blood there is a maximum amount of bacilli which can be destroyed.

(4) Blood whose coagulability has been destroyed by the injection of peptone is still germicidal.

(5) Blood in which coagulation is prevented by the addition of 25 per cent. of magnesium sulfate has its germicidal properties decreased.

(6) Filtered blood-plasma from the horse is germicidal.

Behring<sup>4</sup> has attributed the action of the blood of the white rat on anthrax-bacilli to its great alkalinity. He has made a number of titrations by which he shows that the blood-serum of the white rat is somewhat more alkaline than that of certain animals that are more susceptible to anthrax, such as the rabbit, the guinea-pig, and the cow. His deduction is not justified, because there are many other and

<sup>1</sup> Read by title before the Medical Section of the First Pan-American Medical Congress, Washington, September 5, 1893.

<sup>2</sup> Eighth Annual Report of the Sanitary Commission of the Government of India.

<sup>3</sup> Schlesische Gesellschaft f. Vaterländ. Cultur, 1874.

<sup>4</sup> Archiv f. Hygiene, B. 4.

<sup>5</sup> Zeitschrift f. Hygiene, B. 1.

<sup>6</sup> Ueber die Einwirkung des zellenfreien Blutplasma auf einige pflanzliche Mikroorganismen, Dorpat, 1884.

<sup>1</sup> Deutsche medicinische Wochenschrift, 1887.

<sup>2</sup> Zeitschrift f. Hygiene, B. 4. <sup>3</sup> Ibid., B. 6. <sup>4</sup> Ibid., B. 6.

more important points in which these animals differ more markedly from the white rat than in slight differences in the alkalinity of the blood-serum. Had he shown that the blood of the adult rat, which is not susceptible to anthrax, is more alkaline than that of the young rat, which is susceptible, his argument would have been more plausible; but even then it would not have deserved the dignity of positive evidence.

In 1890, Buchner,<sup>1</sup> aided by Voit, Sittmann, and Orthenberger, made a most valuable contribution to our knowledge of the germicidal properties of blood. The results of this work are stated as follows:

1. The germicidal action of blood is not due to phagocytes, because it is not influenced by the alternate freezing and thawing of the blood, by which the leukocytes of the rabbit are destroyed.

2. The germicidal properties of the cell-free serum must be due to its soluble constituents.

3. Neither neutralization of the serum, nor the addition of pepsin, nor the removal of carbon-dioxid gas, nor treatment with oxygen has any effect upon the germicidal properties of the blood.

4. Dialysis of the serum against water destroys its activity, while dialysis against 0.75 per cent. salt-solution does not. In the diffusate there is no germicidal substance. The loss by dialysis with water must be due to the withdrawal of the inorganic salts of the serum.

5. The same is shown to be the case when the serum is diluted with water and when it is diluted with the salt-solution. In the former instance the germicidal action is destroyed, while in the latter it is not.

6. The inorganic salts have in and of themselves no germicidal action. They are active only in so far as they affect the normal properties of the albuminates of the serum. The germicidal properties of the serum reside in its albuminous constituents.

7. The difference in the effects of the active serum and that which has been heated to 55° C. is due to the altered condition of the albuminate. The difference may possibly be a chemical one (due to changes within the molecule) or it may be due to alterations in mycelial structure. The albuminous bodies act upon the bacteria only when the former are in active state.

We wish at this point to call attention to an inconsistency between the results obtained by Buchner and the conclusions that he draws. In experiment No. 45 he renders the serum slightly acid and adds 0.1 gram of pepsin to each five c. c. of serum (showing by a side experiment that this pepsin actively digests coagulated egg-albumin in neutral solution) and finds that the digestive action of the pepsin does

not lessen the germicidal properties of the serum. In fact he states this in his conclusions, but his ultimate opinion, and the one held by him in his latest contribution, is that the germicidal constituent of the blood is the serum-albumin. How much serum-albumin remains in blood-serum after it has been thoroughly digested with pepsin? He could scarcely have chosen a more positive method of demonstrating that the germicidal constituent is not serum-albumin. Either his pepsin was not active, and on this supposition his experiment is without value, or the active constituent of blood-serum is a substance that is not destroyed or materially altered by peptic digestion. We know that the peptones not only have no germicidal properties, but that they belong to that class of proteids that is most favorable to the growth and development of germs. We recognize this fact when we add peptones to the various artificial media on which we cultivate germs. However we shall return to this subject. At present we shall proceed with the literature of the subject.

The successful researches of Buchner led many other investigators to enter this field of experimentation, and some of them have made valuable contributions to our knowledge of the germicidal action of the blood under varying conditions, but so far as the nature of the germicidal constituent is concerned but little or no progress has been made. Prudden<sup>2</sup> found that ascitic and hydrocele fluids restrain the development of certain germs. Rovighi<sup>3</sup> reported that the germicidal action of the blood is increased in febrile conditions. Pekelharing<sup>4</sup> enclosed anthrax-spores in bits of parchment and introduced them under the skin of rabbits. Thus treated, the spores soon lost their virulence and finally their capability of growth. The destruction of these spores could not have been due to phagocytes, which did not penetrate the parchment, but must have been caused by soluble poisons. Behring and Nissen<sup>4</sup> found that the serum of the white rat, the dog, and the rabbit destroys anthrax-bacilli, while serum obtained from the mouse, sheep, guinea-pig, chicken, pigeon, and frog, has no such action. It will be observed from this that there is no constant relation between the germicidal action of the blood of animals of different species and their susceptibility to the disease caused by the germ. Thus, the rabbit is highly susceptible to anthrax, notwithstanding the fact that its blood destroys large number of these germs. On the other hand, the chicken is immune to anthrax from the moment when it comes from the shell, and yet the bacillus anthracis grows luxuriantly in the extra-vascular blood of the chick.

<sup>1</sup> Medical Record, 1890.

<sup>2</sup> Atti della Accad. Med. di Roma, 1890.

<sup>3</sup> Ziegler's Beiträge, B. 8.

<sup>4</sup> Zeitschrift f. Hygiene, B. 8.

<sup>1</sup> Archiv f. Hygiene, B. 10.

This demonstrates that there is a great difference between the action of extra-vascular blood and that circulating in the body, constantly fed, and in case of need, altered in composition by certain glands.

Halliburton has prepared from the lymphatic glands a globulin which he designates as cell-globulin  $\beta$ , and which agrees with fibrin-ferment in inducing coagulation in plasma. Hankin<sup>1</sup> has tested the germicidal properties of this cell-globulin. His experiments have been conducted in the following manner: The lymphatic glands (in later experiments the spleen also) of a dog, or of a cat, are freed as much as possible from fat and connective tissue, then finally divided and extracted with dilute solution of sodium sulfate (one part of a saturated solution to nine parts of water). The cell-globulin passes into solution, while the other proteids are but sparingly soluble. After twenty-four hours, the fluid is filtered and mixed with an excess of alcohol. The voluminous precipitate containing the cell-globulin is collected on a filter and washed with absolute alcohol. For use, a part is dissolved in water, and a small quantity of a bouillon-culture of the anthrax bacillus is added. From time to time plate-cultures are made, along with control-plates, and in this way the germicidal properties of the substance are demonstrated. Hankin closes this contribution with the following conclusions:

1. Halliburton's cell-globulin  $\beta$  has marked germicidal properties.
2. In this respect it differs from fibrin-ferment.
3. The germicidal properties of this substance seem to be identical with those of serum as described by Buchner, Nissen, and Nuttall.
4. The active properties of the serum are probably due to this or to an allied body.

Bitter<sup>2</sup> has repeated the experiments of Hankin, but fails to confirm them. Bitter states that he has followed Hankin's directions exactly. However this may be, it is certain that the spleen contains a germicidal substance, but whether it can be extracted by the method of Hankin or not we do not know. That the germicidal constituent of the spleen is identical with Halliburton's cell-globulin  $\beta$  or with any other globulin, we very much doubt. It certainly is a nuclein, and it is altogether possible that Hankin obtained traces of this nuclein in his extracts. In this case the extract would show, or fail to show, germicidal properties according to the relative amounts of nuclein and other substances present. The less globulin and the more nuclein present the more marked would the germicidal effect be.

Christmas<sup>3</sup> has prepared a germicidal substance

from the spleen and other organs by the following method:

The animal is killed with ether, opened under anti-septic precautions and the organ removed, cut into fine pieces, covered with fifty cubic centimeters of glycerin and allowed to stand for twenty-four hours, and then filtered. The filtrate is precipitated with five times its volume of alcohol, and this fluid is immediately decanted. The precipitate is washed with absolute alcohol in order to remove the glycerin. Then the traces of alcohol are removed by pressure and the precipitate dissolved in twenty-five cubic centimeters of distilled water. Through this solution air is driven for some hours in order to destroy the traces of alcohol. Then the fluid is filtered and its germicidal action tested.

Bitter has also examined this method, and the impartial reader must see that he has not done so with fairness. However, this fact renders the work all the more valuable because his results confirm the statements of Christmas. Bitter killed his animals by venesection, and, in some cases at least, prepared the substance in unsterilized vessels; but even when this was done the solution was germ-free and manifested marked germicidal properties. Bitter finally finds a difference between this substance and the germicidal constituent of blood-serum; the latter, he states, is certainly destroyed by a temperature of 65°, while the solution of Christmas, after having been heated to this temperature, is still capable of destroying from 35,000 to 40,000 typhoid-bacilli within four hours. Buchner,<sup>1</sup> in his latest contribution to the subject has the following to say in condemnation of Christmas:

"A method given by Christmas for the preparation of germicidal solutions from the organs of normal rabbits has also been tested by Bitter. Germicidal solutions were indeed obtained, which, however, differed materially from active serum, for in three experiments, notwithstanding heating to 65° C., the germicidal action remained."

It is altogether possible that the more powerful action of the solution made by Christmas is due to the fact that it contained the germicidal substances in more nearly a chemically pure condition than they exist in blood-serum. It is also highly probable that the arrest of the germicidal activity of blood-serum by a temperature of 55° C. is not due to the destruction of its germicidal constituent, but is due to the action of the heat on other constituents of the fluid.

Some attempts have been made to determine the nature of the germicidal constituent by the action of precipitating reagents on the proteids of blood-serum. In his latest contribution, Buchner states that he has not been able to obtain a germicidal solution

<sup>1</sup> Centralblatt f. Bakteriologie, B. 9.

<sup>2</sup> Zeitschrift f. Hygiene, B. 12.

<sup>3</sup> Annales de l'Institut Pasteur, t. v.

<sup>1</sup> Archiv f. Hygiene, B. 17.



by precipitating all the proteids with absolute alcohol, freeing the precipitate from alcohol, drying it, and then redissolving. He does not give the methods employed in freeing the precipitate from alcohol, the temperature or the conditions under which it was dried, or the nature of the menstruum by which resolution was effected. In the absence of these needed details, his conclusion that alcohol destroys the germicidal substance must remain open to question. On the other hand, Christmas states that when the proteids are precipitated with alcohol and the precipitate dissolved in a volume of water equal to that of the original serum, the solution thus obtained has a more powerful germicidal action than the serum. Bitter in an experimental review of the statement of Christmas gives the following detailed account of one experiment:

"Ten cubic centimeters of serum were poured into fifty cubic centimeters of alcohol (strength of alcohol not given), stirred, and the precipitate immediately separated from the alcohol by filtration. (He fails to state whether or not sterilized filter-paper was used.) The precipitate was freed from alcohol by pressure between folds of filter-paper (again he fails to state whether or not this paper was sterilized), then dried at 37° C., and mixed with ten cubic centimeters of sterilized distilled water. On being allowed to stand for a short time at 37° C., nearly all of the precipitate was redissolved. The solution was then separated from the deposit by filtration (through unsterilized filter paper?) and tested."

It can scarcely be a matter of surprise that Bitter found germs nearly always present in the solution obtained in this careless manner. However, he did find that the germs present did not develop when the solution was kept at 37° C., and, moreover, that germs added to this solution were destroyed. Bitter concludes that in truth anthrax and typhoid bacilli are destroyed by "precipitated serum," but not so energetically as by normal serum.

Emmerich, Tsuboi, Steinmetz, and Löw<sup>1</sup> have made interesting and valuable contributions relating to the effect of precipitation of the proteids upon the germicidal action of blood-serum. An active serum was dialyzed in a sterilized parchment-paper tube against water for from twelve to eighteen hours. By the expiration of that time the serum-globulin, becoming insoluble on account of the withdrawal of inorganic salts, was deposited. The dialyzer was dried with sterilized filter paper and the globulin-free serum was precipitated with several volumes of alcohol. The precipitate was collected on a sterilized "falten-filter" and the alcohol removed from the precipitate by sterilized porous plates and filter-paper. The precipitate was then finely divided, dried for half an hour in vacuo at 36° C., then rubbed

up in a sterilized mortar and dissolved in sterilized water, to which salt solution had been added. In the solution thus prepared germs did not show, after from three to four hours, either a marked increase or decrease, but when the solution was heated to 100° C., allowed to cool, and then inoculated with germs, the increase was four-hundred-fold within four hours. It was next found that, if instead of water, a 0.05 per cent. aqueous solution of potassic hydrate was employed in dissolving the alcoholic precipitate in the globulin-free serum, this solution possessed all the germicidal strength of the original serum. The same was found to be true of dilute alkaline solutions of the alcohol precipitate in serum from which the globulin had not been removed. The dilute alkali was shown not to have any germicidal action in and of itself. From these experiments the investigators mentioned conclude that the germicidal constituent of blood-serum is an alkaline compound of serum-albumin. They also found that heating the serum-albumin alkaline solution to 65° C., or higher, destroyed its germicidal action, and they explain this effect of heat on blood-serum and on their artificial solution by supposing that the high temperature breaks up the combination of the alkali with the serum-albumin. Furthermore, they found that a serum that had been rendered inactive by a temperature of 55° C. could be regenerated in part at least by the addition of the small amount of alkali mentioned.

Since Fodor<sup>2</sup> and Zuntz<sup>3</sup> have shown that freshly-drawn blood rapidly decreases in alkalinity on standing *in vitro*, an explanation of the fact that blood-serum rapidly loses its germicidal properties naturally suggests itself. Emmerich and his co-workers confirm their belief in this theory by demonstrating that blood-serum that has been rendered very feebly acid (0.67 part of sulphuric acid per mille) has no germicidal action, but furnishes a good culture-medium.

The foregoing investigations are very valuable, inasmuch as they show the important rôle that the small amount of alkali plays in the germicidal action of blood-serum. This had, indeed, already been demonstrated by Fodor<sup>3</sup> by a quite different line of investigation. This experimenter found that the resistance of rabbits to anthrax is markedly increased by the administration, by the stomach or subcutaneously, of sodium phosphate, carbonate, or bicarbonate, or of potassium carbonate.

Löw concludes that the introduction of the alkali into the albumin-molecule increases its liability, and he cites examples from organic chemistry in support of this view.

<sup>1</sup> Centralblatt f. Bakteriologie, B. 12.

<sup>2</sup> Centralblatt f. Bakteriologie, B. vii.

<sup>3</sup> Centralblatt f. med. Wissenschaft, 1867.

<sup>3</sup> Centralblatt f. Bakteriologie, B. vii.



There are some additional points of interest in the theory of Emmerich and his assistants. As has been stated, they believe that the serum-albumin is the germicide, but they think it highly probable that only a comparatively small part of the albumin is active, and this small part, they suppose, originates in the albumin of the daily food, which is converted into lymph-cells, and by the disintegration of these it passes into solution in the blood. They admit, however, that there are some reasons for believing, with Buchner, that the whole of the serum-albumin is active. They state that it is possible, *but highly improbable*, that the germicidal substance is not the serum-albumin, but some substance that is precipitated along with this by alcohol and other agents.

We hope to show that the germicidal agent is not serum-albumin and that this "highly improbable" substance does exist.

In a short and somewhat unsatisfactory review of the report of Emmerich and his co-workers, Buchner<sup>1</sup> devotes himself to a consideration of the question of the regeneration of serum rendered inactive by heating to 55° C. on the addition of an alkali. He details one experiment made by himself on this point. The experiment confirms the work of Emmerich, but Buchner offers an interpretation that is wholly theoretic and by no means convincing. He finds that the regenerated serum, when heated to 60° C., still has a retarding effect upon the growth of germs, and he argues from this that the germicidal action of the "regenerated serum" is (for some unknown reason) due to its being less suited to the growth of bacteria. No one knows better than Buchner the influence of various chemical substances on the temperature at which an active serum is converted into an inactive form, and yet he overlooks altogether the possible effect of increased alkalinity on this conversion. Had he heated the regenerated serum to 100° C. he would then have found that it forms a very fertile culture-medium.

Hankin<sup>2</sup> has recently published a paper that is more valuable in its suggestions than in its experimental details. He suggests that the germicidal substance is a special secretion of the eosinophile granular cells. The granular matter in these cells is, according to his theory, the antecedent of the germicidal substance.

There are many other minor contributions to this subject, but those mentioned contain all the essential points, and there is no necessity for a further review of the literature. It is true that Aronson<sup>3</sup> has very recently announced to the Berlin Medical Society that he has isolated a powerful antitoxin from the blood-serum of animals rendered immune

to diphtheria, and that with this substance he has cured guinea-pigs infected with this disease. Following the example of another illustrious German investigator, he refuses to tell how this curative substance is prepared. It is needless to say that this manner of dealing with scientific investigations has not as yet found favor with the unsophisticated profession in the new world.

From a careful and critical study of the investigations that have been briefly reviewed, we have come to the following conclusions:

1. The serum-albumin is not the germicidal substance in blood-serum. As has been stated, either this must be true or the experiment by which Buchner demonstrated that an active pepsin does not destroy the germicidal action of blood-serum must have been an error; because peptic digestion readily and completely converts serum-albumin into peptones, and we know that peptones are especially favorable to bacterial growth.

2. The germicidal substance must belong to the proteids. Otherwise it would be difficult to explain the fact that a temperature of 55° C. renders blood-serum inactive.

3. The only proteid likely to be present in blood-serum and which is not destroyed by peptic digestion is nuclein.

Having reached these conclusions, the following questions naturally present themselves:

1. Is there a nuclein in blood-serum?

2. Has this nuclein, if there be one, germicidal properties?

These questions we have attempted to answer.

Dogs and rabbits were the animals from which the serum was obtained. Healthy animals that had not previously undergone any experimentation were selected. The animal was firmly fixed in a holder, the carotid was laid bare under antiseptic precautions. A ligature and a small clamp were applied to the artery about two inches apart, the former distad, and the latter centrad. Then a slit in the artery was made with a sterilized knife, and a small sterilized glass canula, with sterilized and dried rubber tube leading into a sterilized Erlenmeyer flask, was introduced into the artery and held in place by another ligature. Then the clamp was removed and the blood flowed into the flask. In each case the animal was bled to death. The flask containing the blood was placed in the ice-chest and allowed to remain for twenty-four hours. By the expiration of this time, a wine-colored serum had separated. This serum was poured into a second sterilized flask and about ten volumes of a mixture of equal parts of absolute alcohol and ether were added. This produced a voluminous precipitate that was nearly white. This was allowed to stand

<sup>1</sup> Centralblatt f. Bakteriologie, B. xii.

<sup>2</sup> Ibid.

<sup>3</sup> Berliner klin. Wochenschrift, 1893.

twenty-four hours, and in some cases much longer, the alcohol and ether twice, or more often, during the time, being decanted and replaced by equal volumes. Then the supernatant fluid was decanted and an equal volume of a 0.2 per cent. solution of hydrochloric acid containing active pepsin was added, and the flask placed in an incubator at 38° C. and the digestion was continued until the fluid failed to respond to the biuret test for peptones. Each time this test was made the fluid was decanted from the undigested portion and replaced by an equal volume of fresh digestive fluid. In some instances the flask containing this fluid was allowed to stand in the incubator for several days. This was not necessary in order to complete the digestion, but was allowed as a matter of convenience. In all cases the digestion was prompt and proceeded to a certain point, when it ceased altogether. The undigested portion was small in amount and grayish in color. This was collected on a small sterilized filter and washed first with 0.2 per cent. solution of hydrochloric acid, and then with alcohol. After the washing with alcohol, the filter was allowed to stand exposed to the air for half an hour or longer in order that all of the alcohol might pass through or evaporate. The precipitate was then dissolved in a sterilized solution of potassic hydrate. The strength of this alkaline solution usually employed was 0.12 per cent. Usually this solution contained in addition to the alkali 0.6 per cent. of sodium chlorid. In some instances a solution containing 1.2 grams of potassic hydrate, 6 grams of sodium chlorid, and 1 gram each of sodium bicarbonate and disodium hydrogen phosphate to one liter of water was employed as a solvent. The solution was filtered through a Chamberland tube and received in a sterilized flask.

The solution thus obtained was perfectly clear, colorless, and did not respond to the biuret test. The addition of strong nitric acid produced a cloudiness, which dissolved on the further addition of the acid. This acid solution did not become yellow on being heated, but did so after the addition of ammonia.

We have now answered the first question. Blood-serum contains a nuclein. We hope to investigate at some time in the future the relation between this nuclein and fibrin-ferment.

The origin of the nuclein found now for the first time in blood-serum is an interesting question. Does it come from the disintegration of the polynuclear cells, or shall we regard certain white blood-corpuscles as unicellular organs whose function it is to secrete this nuclein?

In proceeding to determine whether or not this nuclein has germicidal properties, the solution was distributed in sterilized test-tubes, five c.c. being

placed in each tube. It should be stated that in dissolving the nuclein, the volume of the solvent employed was in all cases the same as that of the blood-serum from which the nuclein was obtained. These tubes were inoculated with different germs and plates made at varying intervals of time, in order to test the germicidal action. One and the same platinum loop was used in the preparation of each plate.

#### EXPERIMENT I.

A nuclein-tube was inoculated with the bacillus of *Asiatic cholera*, and plates made from this gave the following results:

Time,	Imme- diately	5 min.	15 min.	30 min.	1 hr.	1½ hr.	22 hrs.
No. of colonies,	2100	43	54	71	90	115	1200

That the alkali in which this nuclein was dissolved did not cause the decrease in the number of germs is shown by the subsequent increase.

#### EXPERIMENT II.

##### *Staphylococcus pyogenes aureus.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	4000	1720	1050	810	0

#### EXPERIMENT III.

##### *Anthrax bacillus without spores.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	100	43	10	1	0

#### EXPERIMENT IV.

##### *Cholera-germ.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	470	45	1	0	410

It may be stated that the final increase in the number of cholera-germs occurred both in the nuclein-solution prepared from the serum of the rabbit and that prepared from the serum of the dog.

#### EXPERIMENT V.

##### *Staphylococcus pyogenes aureus.*

Time,	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of colonies,	Countless	22,000	12,525	155	0

#### EXPERIMENT VI.

##### *Anthrax-bacillus without spores.*

Time,	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of colonies,	1120	165	0	0	0

All of the foregoing experiments were made with the solution of nuclein in sterilized water containing 0.12 per cent. potassic hydrate and 0.6 per cent. of sodium chlorid. The following were made in the other solution mentioned. It may be stated that the culture of the aureus experimented with retained its vitality for days in water containing 0.5 per cent. of potassic hydrate.

#### EXPERIMENT VII.

##### *Staphylococcus pyogenes aureus.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	5000	2500	1600	1200	0

## EXPERIMENT VIII.

*Anthrax-bacillus without spores.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	43	7	0	0	0

## EXPERIMENT IX.

*Cholera-bacillus.*

Time,	Immediately	1 hr.	4 hrs.	7 hrs.	24 hrs.
No. of colonies,	350	105	150	42	0

## EXPERIMENT X.

*Staphylococcus pyogenes aureus.*

Time,	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of colonies,	Countless	25,000	5525	65	500

## EXPERIMENT XI.

*Anthrax-bacillus without spores.*

Time,	Immediately	1 hr.	5 hrs.	19 hrs.	24 hrs.
No. of colonies,	430	0	0	0	0

We have made many other tests of the germicidal action of the nuclein obtained from blood-serum, but as all of them gave practically the same results, further repetition is unnecessary.

We have also made many experiments on the effect of heat and other agents on the germicidal action of this nuclein, but we prefer to report these later, as we have obtained some unexpected results. Suffice it to say that while boiling destroys the germicidal action, the temperature to which these solutions may be heated and still show some retarding action on germs has surprised us.

The fact that the germicidal constituent of blood-serum can be isolated has an important practical bearing. Blood-serum therapy has proved impracticable on account of the large amount of the fluid which must be injected. Nuclein-therapy now promises to enable us to avoid this difficulty, and possibly the near future may find us using this agent in the treatment of disease. The nuclein may be obtained from an animal rendered immune to diphtheria, and a sufficient quantity of this injected into the blood or under the skin of a child suffering with this disease may effect a cure, but we will not prophesy. The future will tell us what it has in store when the future shall have become the present.

ATONY OF THE STOMACH.<sup>1</sup>

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ATONY of the stomach is that condition in which the muscular walls have lost their tonicity, with a resultant motor insufficiency, in consequence of which the stomach is unable to pass its contents into the intestine at the normal rate. Although this condition has long been recognized, it has not received

sufficient study, and great confusion still exists concerning its significance. By some authors it is classified as a purely nervous disorder; by others as a form of gastrectasia; some pass it by in a cursory manner.

Kussmaul<sup>1</sup> was among the first to make a distinction between atony and dilatation. He showed that in gastrectasia due to stenosis of the pylorus or of the duodenum, vomiting is very frequent during the entire course of the disease, and is a characteristic sign, while in atony it rarely occurs. Oser<sup>2</sup> attempts to distinguish between dilatation and atony, and states that in actual dilatations lavage is of great benefit, but that in atony it is of little service. Naunyn<sup>3</sup> lays stress on fermentation in dilatation of the stomach, and shows that in muscular insufficiency fermentation is usually produced. Minor forms without fermentation, he believes, should be excluded from the chapter of true gastrectasia. Germain Sée<sup>4</sup> likewise distinguishes clinically between dilatation and atony. Von Pfungen<sup>5</sup> has published a monograph devoted to this subject. He distinguishes the condition not only from gastric neuroses but also from gastrectasia.

For clearer views concerning this subject we are much indebted to Boas.<sup>6</sup> In his recent work on *Diseases of the Stomach* he describes this disorder at length, devoting a special chapter to it as a separate pathologic condition. He suggests the name myasthenia (muscle-weakness) as being more appropriate than atony or muscular insufficiency.

As regards causation, atony may be of two kinds—primary and secondary. Primary atony is found in persons who have been in the habit of consuming large quantities of indigestible food; the excessive use of fluids especially predisposes to this disorder; frequently, however, no such cause is assignable. Atony may be secondary to many other diseases, such as those of the brain and cord, typhoid fever, anemia, tuberculosis, and diseases of the gastro-intestinal tract, such as gastroptosis, enteroptosis, chronic gastritis, and nervous dyspepsia. Cholelithiasis is not an infrequent cause (Boas<sup>7</sup>). I have found gastric atony of rather frequent occurrence in diabetes. According to Peyer,<sup>8</sup> it is often found as a neurosis second-

<sup>1</sup> Kussmaul: "Peristaltische Unruhe des Magens," Volkmann's klinische Vorträge, 1880, No. 181.

<sup>2</sup> Oser: Ursachen der Magenerweiterung, Wiener Klinik, 1881.

<sup>3</sup> Naunyn: "Verhältniss der Magengährungen zur mechanischen Insufficienz," Deutsches Archiv für klin. Medicin, Bd. xxxi, 1882, S. 225.

<sup>4</sup> Sée: "De la Dilatation atonique de l'Estomac," Revue de Médecine, 1884, 529.

<sup>5</sup> Von Pfungen: "Atonie des Magens," Klinische Zeit und Streitfragen, Wien, 1887.

<sup>6</sup> Boas: Specielle Diagnostik und Therapie der Magenkrankheiten, II. Theil, p. 59.

<sup>7</sup> Boas: Loc. cit., p. 59.

<sup>8</sup> Peyer: Volkmann's Sammlung klinische Vorträge, 1890, No. 356, p. 3173.

<sup>1</sup> Read at the semi-annual meeting of the Medical and Surgical Faculty of Maryland (Annapolis), November 23, 1893.



ary to disease of the generative organs in males. Bamberger<sup>1</sup> finds it frequently congenital, and according to Zweifel<sup>2</sup> it is not uncommon in children, due, as he believes, in many cases to improper feeding. Kundrat<sup>3</sup> also finds it in children, and especially among those that have been subjected to many attacks of gastro-intestinal catarrh. Pfungen<sup>4</sup> has shown that atony of the stomach often originates during the period of puberty; it is not improbable that the precocious appetite of this age, leading to the consumption of much indigestible food, is the cause of this disturbance. For the same reason it is not uncommon after typhoid fever. Pfungen<sup>4</sup> relates such a case in a woman in whom atony of the stomach was directly attributable to an attack of typhoid fever. No age seems to be exempt from the disorder, and it appears with equal frequency in males and females.

As to symptoms, most patients complain of a loss of appetite, though in rare instances the appetite may be fully maintained, at least in the first stages. When the condition is secondary to nervous disorders the appetite may even be increased (Peyer<sup>5</sup>). A feeling of pressure or fulness comes on, usually during or after meals, and this is especially marked after the ingestion of fluids. In light forms the distress reaches its height immediately after meals, and gradually passes off during the next hour, to be again aggravated by the smallest amount of food. In severer forms it may be so great as to continue with intensity for hours after meals, and become still more aggravated by the following meal. This feeling of pressure is accompanied by heartburn, pyrosis, eructations of gas, and, rarely, by vomiting. The quality as well as the quantity of the food ingested is productive of the symptom; fluids are most likely to induce pressure. Constipation is almost a constant symptom, and headache of a dull character is frequently present, and may at times lead to actual vertigo. Nervous symptoms of various kinds may be present, such as palpitation of the heart and indefinite pains, and on this account the disorder is frequently mistaken for neurasthenia.

On physical examination the stomach is found to be enlarged, so that the greater curvature reaches to, or below, the level of the umbilicus. Peristaltic and anti-peristaltic movements of the walls of the stomach may occasionally become visible. With but

small quantities of fluid in the stomach (from 250 to 300 c.c.) a splashing sound may be produced by quick movements of the patient, or by a series of quick shocks with the fingers upon the abdomen. The boundary of the greater curvature of the stomach may be determined by marking the limit of this splashing, and sometimes when the stomach is dislocated downward, the lesser curvature also. The boundary of the greater curvature may likewise be located by percussion; especially is the method of Dehio<sup>1</sup> to be recommended: he allows a quarter of a liter of water to be swallowed, and the position of the greater curvature obtained by the limit of flatness against the tympanitic transverse colon; by drinking more water the curvature sinks until it reaches the umbilicus. In normal conditions it does not reach beyond this line. In atony, however, with but little fluid it sinks quickly below this limit.

Still more reliable is the method by expansion of the stomach with gas, which may be accomplished by the old method of Frerichs. Carbon-dioxid gas is produced by the ingestion of a teaspoonful of sodium bicarbonate dissolved in a small quantity of water, followed quickly by the ingestion of the same quantity of tartaric acid in water. But it is simpler and better to introduce air into the stomach through the stomach-tube by means of an ordinary double bulb of a spray apparatus. On percussion the stomach will be found to reach to, or below, the umbilicus.

In atony, the stomach is not only enlarged, but its motor function is also markedly impaired, and it does not propel its food into the intestine at the normal rate. The propulsive force of the stomach may be measured by the salol test of Ewald and Sievers.<sup>2</sup> Fifteen grains of salol are swallowed during a meal, and the urine is tested for salicyluric acid at half-hour intervals, beginning one-half hour thereafter, and continuing until the response occurs. Usually salicyluric acid appears in the urine in from forty to sixty minutes after ingestion. It is easily recognized by the violet color produced by the addition of a few drops of a solution of neutral ferric chlorid. The modification of this method by Huber<sup>3</sup> may be employed; according to this the urine is tested for salicyluric acid twenty-four hours after its ingestion, the reaction normally disappearing after this period. In patients suffering with enfeebled motor activity of the stomach, as in cases of atony or gastrectasia, the reaction lasts much longer. Of greater value is the test-dinner of Leube, consist-

<sup>1</sup> Bamberger: "Krankheiten d. Chylopoet. Systems." Virchow's Handbuch, Erlangen, 1855, p. 327.

<sup>2</sup> Zweifel: Untersuchungen über d. Verdauungsapparat der Neugeborenen. Berlin, 1874, p. 47, and Centralblatt für die med. Wissenschaft, 1874, No. 59, p. 939, etc.

<sup>3</sup> Kundrat: Gerhard's Handbuch der Kinderkrankheiten, Bd. iv, ii, p. 368.

<sup>4</sup> Pfungen: Loc. cit., p. 541.

<sup>5</sup> Peyer: Loc. cit., p. 3174.

<sup>1</sup> Dehio: Zur physic. Diagnostik der mechanischen Insufficienz des Magens. Verhand. d. Kongress f. innere Medicin, 1888.

<sup>2</sup> Ewald und Sievers: "Zur Pathologie und Therapie der Magenectasien," Therap. Monatsh., August, 1887.

<sup>3</sup> Huber: "Die Methoden zur Bestimmung der motorischen Thätigkeit des Magens," Correspondenzbl. für Schweizer Aerzte, 1890.

ing of a plate of soup (400 c.c.), scraped beef (60 grams), a piece of white bread (50 grams), and a glass of water (200 c.c.). Under normal conditions the stomach will be found empty in from six to seven hours. Should particles of food be still present after this time the motor function of the stomach is much impaired.

A most important test is the condition of the stomach before the ingestion of food (Boas<sup>1</sup>). If the contents of the stomach be expressed in the morning before the ingestion of food, the stomach will be found entirely empty and free of all food-remains. This is not so in cases of gastrectasia, in which greater or smaller quantities of food will be found. Boas has devised still another test, which I have found of great service. The test-supper of Boas consists of white bread with butter, cold meat, and a large cup of tea. In atonic conditions the stomach will be empty the next morning, but in gastrectasia it still contains food-remains at that time.

The examination of the gastric contents is of great importance. The expression one hour after an Ewald test-breakfast<sup>2</sup> shows large quantities of solid contents, not separating into the characteristic three-layered fluid of gastrectasia,<sup>3</sup> or containing yeast-spores or sarcinae.

Upon chemic examination the contents show in most cases a normal proportion of hydrochloric acid, pepsin, and casein ferments. According to Boas,<sup>4</sup> at the very beginning of atony of the stomach, through constant mechanic irritation of the food upon the walls of the stomach, an increased acid-production results; in fact the irritation may be so great that even hypersecretion may be produced. A case of this kind has come under my observation. In other cases there may be a condition of subacidity.

The symptoms of atony of the stomach are well illustrated by the following two cases:

CASE I.—F. B., barkeeper, thirty-eight years of age, with a good family history, had malaria three years ago, and since then has enjoyed good health. Some months ago the patient was taken "with heaviness in the stomach after eating." The heaviness was soon followed by a sense of severe pressure and fulness after meals. Loss of appetite, nausea, headache, and constipation were also marked. Vomiting has never been present. This disorder has gradually increased in severity, until small quantities of fluids now cause great pressure and inconvenience. The man is rather badly nourished, his mucous membranes are pale, the pulse weak, the tongue

coated. The heart and lungs are normal, and the liver and spleen are not enlarged. The stomach is tender to pressure along the line of the linea alba, from the ensiform cartilage to the umbilicus. The greater curvature of the stomach is four centimeters below the umbilicus. By quick shocks a splashing sound can be elicited at this point. Upon swallowing a very small quantity of fluid the splashing becomes much more distinct. By inflation of the stomach with air the lesser curvature is found in normal position, while the greater curvature is four centimeters below the umbilicus. The salol-test shows marked retardation of the motion of the stomach. Seven hours after a Leube test-dinner the stomach still contains large quantities of food. Several examinations of the contents of the stomach before the ingestion of food in the morning show no remains of food. This is likewise the case when a Boas test-supper has been taken the previous evening.

The examination of the gastric contents one hour after an Ewald test-breakfast shows large quantities of food remaining, with an acidity of 70; free hydrochloric acid, 0.17 per cent., and no lactic acid. The urine is normal in quantity, containing neither sugar nor albumin.

CASE II.—M. W., a colored washerwoman, twenty-three years of age, a widow, with a good family history, had smallpox when a child, and has since been in good health. Fifteen months ago the patient was seized, directly after meals, with a sense of pressure in the stomach. This was especially severe after dinner; water and fluids are badly borne, and always cause inconvenience. The appetite is usually bad, but at times is increased. Constipation has existed for years.

The patient is a well-nourished woman; the pulse is strong; the tongue coated; the heart and lungs normal; the liver and spleen not palpable. The right kidney is palpable and dislocated to the second degree. The stomach is not tender to pressure. After swallowing but 200 c.c. of water a marked splashing sound can be produced in the region of the stomach, the limit of which is found three finger-breadths below the umbilicus; this is verified by the inflation of air. The stomach is found empty in the morning, Boas' test-supper having been taken the evening before. The examination of the gastric contents after an Ewald breakfast shows large quantities of solid contents, with an acidity of 58, HCl 0.19 per cent. The urine is normal in quantity, and contains neither sugar nor albumin.

Among the frequent complications of atony may be mentioned dislocation of the stomach (gastrop-tosis), and also of the bowel (enteroptosis), and dislocation of the right kidney. The association of dislocation of the kidney with dilatation of the stomach has been pointed out by Bartels,<sup>1</sup> Müller-Warnecke,<sup>2</sup> and Litten.<sup>3</sup> Litten endeavored to

<sup>1</sup> Boas: Loc. cit., p. 68.

<sup>2</sup> The Ewald test-breakfast consists of an ordinary dry roll and 300 c.c. of water.

<sup>3</sup> An upper brown foam, a yellowish middle layer, and a lower dark slimy layer containing food-particles; bubbles of carbon dioxide can be constantly seen rising to the top.

<sup>4</sup> Boas: Loc. cit., p. 66.

<sup>1</sup> Bartels: Schmidt's Jahrb., Bd. clviii, p. 225.

<sup>2</sup> Warnecke: Berl. klinische Wochenschrift, 1877, No. 30, p. 49.

<sup>3</sup> Litten: Verhand. des Kongr. für innere Med., vi, 1887, p.

demonstrate that dilatation of the stomach may cause the liver to move downward, carrying with it the right kidney. This explanation is accepted by but few. Nothnagel<sup>1</sup> claims that Litten's cases were for the most part cases of atony; though dislocation of the right kidney is quite commonly associated with atony, he maintained that this association is merely a coincidence. It is probable that the atony in these cases is secondary to a gastropptosis. The following case illustrates this condition.

CASE III.—L. O., white, female servant, thirty-two years of age, single, came to the dispensary for treatment. She had been healthy when a child, but for years had suffered with constipation. Four months ago she had taken a large dose of "salts" on two successive nights; for several days this was followed by severe diarrhea, which was checked by medicine, but leaving a great sense of pressure in the region of the stomach, nausea, and heaviness in the epigastrium after eating. These symptoms have been very severe ever since; in the intervals between meals this pressure gradually passes away. In moving in bed at night the patient has noticed a splashing sound in the stomach.

The patient is of small stature, rather anemic, the pulse weak, the heart and lungs normal, the liver and spleen not palpable, the right kidney dislocated; points of tenderness are noted along the linea alba from the ensiform cartilage to the umbilicus; the region of the spleen is also tender to pressure; upon quick shocks with the fingers a splashing sound is heard at a distance of five finger-breadths above and six finger-breadths below the umbilicus. On inflation with air the smaller curvature of the stomach is found five finger-breadths above the umbilicus, and the greater curvature six finger-breadths below. Seven hours after a Leube test-dinner the stomach is found to contain large quantities of food-remains. It does not, however, contain particles of food early in the morning before the ingestion of nourishment; one hour after an Ewald test-breakfast large quantities of solid contents are, however, expressed. The acidity is 60; HCl 0.1 per cent., without lactic acid.

On inflating the colon with air it is found dislocated downward, the upper border of the transverse colon being two finger-breadths below the umbilicus. The urine contains neither sugar nor albumin, and is normal in quantity.

Atony of the intestine is not an infrequent concomitant of atony of the stomach—indeed, both may be present for years, and it may be difficult to tell which is the primary trouble. Of twenty cases of atony of the bowel recently examined by me, fourteen were complicated with atony of the stomach.

Gastric vertigo, the vertigo dyspeptica of Trouseau,<sup>2</sup> which this writer believed to be caused by

chronic gastritis, probably depends in most cases upon atony (Boas). I have had a case of this kind under observation for some time.

CASE IV.—M. L., thirty-two years of age, a laborer, of good family history, had been in good health until ten years ago, but since then has had gastric trouble. He has had nausea, headache, great pressure after eating, and constipation. Recently the headache has frequently passed into vertigo, which at times becomes so intense that the man is unable to stand. These attacks of vertigo appear at irregular intervals, days sometimes passing by without them. The patient has become very nervous. The man is a large, well-developed individual, with strong pulse; the tongue is coated; the heart and lungs are normal; the liver and spleen are not palpable; the right kidney is dislocated (second degree); the stomach is tender along the median line from the ensiform cartilage to the umbilicus; a splashing sound reaches a hand's breadth beneath the umbilicus, which marks the location of the greater curvature, as was verified by the inflation of air. The stomach contains large quantities of food-remains one hour after the test-breakfast of Ewald. Acidity 62; HCl 0.149 per cent. The urine is clear, containing neither sugar, albumin, nor casts.

Atony of the stomach must be differentiated from nervous dyspepsia and gastrectasia or (dilatation).

According to Bamberger,<sup>1</sup> the variability and rapid change of symptoms, the presence of other nervous symptoms, the normal and increased appetite, and the absence and rapid disappearance of the gastric disturbance, distinguish nervous dyspepsia from atony. At times a diagnosis becomes very difficult and sometimes impossible. It must not be forgotten that atony is frequently a complication of most nervous disorders.

From gastrectasia, atony is diagnosticated by the absence of food-remains from the stomach in the morning before the ingestion of food; by the absence of the three-layered fluid of gastrectasia, and by the absence of sarcinae and yeast-spores. There is a marked diminution in the secretion of urine in gastrectasia, but not in atony.

Atony of the stomach is a chronic disorder, and may last for years. It is quite amenable to treatment, and, though the disorder may not be perfectly cured, the patient may be relieved of all suffering. Atony may pass into gastrectasia after years, but this is rather a rare occurrence. Boas<sup>2</sup> has observed but a dozen of such cases.

The treatment of myasthenia depends in general upon its cause. If it is secondary, the treatment must be directed to the primary disorder. The dietetic treatment is highly important. It is necessary that the quantity of fluid taken shall be very

<sup>1</sup> Nothnagel: *Verhand. des Kongr. für innere Med.*, vi, 1887, p. 242.

<sup>2</sup> Trouseau: "Vertigo dyspeptica," *Gaz. des Hôpitaux*, 1862.

<sup>1</sup> Bamberger: "Krankh. der Chylopoët. Systems," *Virchow's Handbuch*, Bd. vii, 1, 1855, p. 270.

<sup>2</sup> Boas: *loc. cit.*, p. 67.



small. According to Boas not more than from one to one and a half liters of fluid should be taken daily, though in general larger quantities of milk are contra-indicated; in some cases this food is well borne and proves serviceable. The examination of the acidity of the gastric contents gives us indications for the regulation of the diet. If superacidity exists a meat-diet in general is indicated. To this can be added soft-boiled eggs, with but few vegetables. Butter should be allowed in small quantities. In cases of subacidity the more digestible forms of meat should be allowed in smaller quantities. The vegetable diet may be increased in these cases.

In the treatment of the chronic constipation which accompanies most of these cases, my experience coincides with that of Boas. The use of cathartics is in most cases to be deprecated. The method that I carry out, and that I have seen practised with much success in the polyclinic practice of Dr. Boas,<sup>1</sup> is the proper regulation of the diet. Such substances are given as foods as stimulate the peristalsis of the intestine; for this purpose, Graham bread, fruits, and vegetables are ordered in rather large quantities; to these is added milk-sugar, which may be used twice daily in teaspoonful doses to sweeten coffee or milk, and which thus acts as a purgative.

In other cases of constipation, when the treatment just described proves ineffectual, injections of various kinds may prove beneficial. In three cases I have had excellent results from the use of the oil injections recently recommended by Fleiner.<sup>2</sup>

In atony of the stomach, Boas<sup>3</sup> highly disapproves of the use of lavage. He considers fermentation and decomposition the only indications for this procedure; and inasmuch as these are entirely absent in this disorder, lavage is quite superfluous. In regard to this disorder at least, I am convinced of the truth of this statement.

In two cases in which I have practised this form of treatment, not only was no relief obtained, but the pressure was more marked and persistent than before the treatment was undertaken. Of greater benefit is the use of the stomach-douche, especially in those cases depending upon the various gastric neuroses. Still more beneficial is the use of electricity which may be applied either extra-ventricularly or intra-ventricularly by means of Einhorn's electrode. The best results are obtained by the intra-ventricular method.<sup>4</sup> The tonicity of the muscular walls of the stomach are influenced by the

faradic current. Painful conditions are alleviated by the galvanic current, the kathode being used intra-ventricularly, the anode placed upon the fundus of the stomach. To this may be added massage of the abdomen, the effect of which is to increase the peristalsis of the intestine and to strengthen the abdominal walls.

In regard to the medicinal treatment, preparations of strychnin seem to serve the best purpose. Either strychnin sulfate or the extract of nux vomica may be given in pill-form. To allay the feeling of pressure, which is a constant and annoying symptom, the extract of belladonna may be prescribed. When there is a diminished secretion of hydrochloric acid, fifteen-drop doses of dilute hydrochloric acid, given, according to the method of Ewald,<sup>1</sup> several times after meals, is indicated.

In cases of increased acidity, sodium bicarbonate should be ordered after meals. Pfungen recommends this remedy very highly.

#### THE TREATMENT OF EXOPHTHALMIC GOITER.

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(Concluded from page 677.)

A REVIEW of the cases is herewith appended:<sup>2</sup>

CASE I.—Graves' disease; enlarged thyroid; marked circulatory disturbance; no exophthalmos; dyspnea; convulsions, originally perhaps epileptiform, but later hysteric.

The cause was found to reside in a neurotic tendency, conjoined with repeated exposure to cold, and sitting in wet shoes during work, at the age of nineteen, culminating in a profound attack of exhaustion, nervous chill, rapid heart-beat, and overwhelming sense of suffocation. From this time on the heart was markedly disordered. There were present, together with several hysterical manifestations, repeated hemoptysis, cough, and progressive emaciation. An alarming attack of blood-spitting sent her to a hospital for four weeks, where she was treated for pulmonary tuberculosis. Soon afterward the urine was suppressed for three days, without pain; then a dark, offensive fluid passed, and gradual recovery followed. Finally, another profound over-exertion, five years ago, brought her under my care. The examination then showed a pale, thin, unmarried woman, aged twenty-three; the respiration from 24 to 30; the pulse fairly regular, from 130 to 135; constant cough, throbbing carotids; pupils widely dilated. There was complete mydriasis, but no lesion of the fundus. The heart was laboring; a loud, musical murmur was heard over the base; the apex-beat was

<sup>1</sup> Boas: Loc. cit., p. 73.

<sup>2</sup> Fleiner: "Ueber die Behandlung der Constipation und einige Dickdarmaffectionen mit grossen Oelklystieren," Berlin. klin. Wochenschrift, Nos. 3, 4, January 16 and 23, 1893.

<sup>3</sup> Boas: Loc. cit., p. 75.

<sup>4</sup> Einhorn: Deutsche med. Wochenschrift, August, 1893, Nos. 34, 35.

<sup>1</sup> Ewald: Klinik der Verdauungskrankheiten, Berlin, 1893, ii, p. 321.

<sup>2</sup> Journal of the American Medical Association, April 14, 1888.

displaced downward and outward; *bruit de diable* was heard. The thyroid gland was enlarged, especially the right, and conveyed a thrill to the hand; the neck measured  $14\frac{3}{4}$  inches in circumference; the skin was pale and oily-looking; sweating occurred readily, and chilliness caused distress; the legs were edematous; menstruation had been absent for three years; the bowels were constantly loose; the urine was small in amount, bright-red with blood, and had a specific gravity of 1009; no casts; the knee-jerks were excessive.

Treatment was as systematic as the circumstances would permit: carefully regulated feeding and rest; simple, diluent drinks; iron in the form of Basham's mixture and digitalis; hot hip-baths; belladonna-plasters over the excited heart; later, cod-liver oil and bromids with digitalis. In a week the pupils became responsive to light, the cough greatly moderated, the urine was only smoky, and the heart-sounds better defined. Her circumstances at home were exceedingly unfortunate; dominated by a fierce virago of a stepmother, and perpetually under distressing domestic environment. However, in six months the girl seemed practically well. Twice since treatment the pupils have been widely dilated on catching a slight cold, and once only the urine showed albumin again. The menstruation has appeared twice; the pulse has been reduced to 85 or 90 in the erect posture.

The subsequent history of this case I followed throughout three or four years at varying intervals. Electricity was used for a time, but she would not continue it. General measures directed toward improving her health and relieving her troubles, domestic and physical, were satisfactorily pursued, and when the girl passed out of sight, I think by moving to a distant part of the country, she considered herself perfectly well of the original difficulty. The skin-activity returned until nothing was left to mark the original seat here but a slight tendency to leakiness. The pulse maintained a fair equilibrium, the thyroid enlargement had entirely disappeared, and I regard the case as cured, in spite of the very unfavorable attendant circumstances. The woman made a very unfortunate marriage with a man who drank and who abused her. She lived with him for six or eight months, then finally abandoned him, and took up several different kinds of laborious work, maintaining herself comfortably. At last accounts, in the year 1891, she was going to live with relatives in a distant place.

CASE II.—Mrs. H., aged twenty-eight, gave no neurotic history. She had two living children; there was marked exophthalmos, with the presence of Von Graefe's sign; irregular, excitable circulation; steady loss of vigor; slight, though well-defined, thyroid enlargement. She had been under my observation since 1881. The difficulties for which I originally treated her had to do with menstrual derangements and great dyspnea; the pulse varied constantly with the smallest emotional changes, and slight exertion caused it to run up to nearly 200 and produce distressing trouble with the breath. This lady was in comfortable circumstances, but, nevertheless, her responsibilities as a mother could

not be entirely ignored—certainly she would not obey directions as I would have liked—nevertheless, I enforced as much of systematic feeding, rest, and other measures as possible. The medicinal measures consisted chiefly of digitalis and ergot, together with iron and other tonics, and in six or eight months there remained only the dusky, oily skin, the eye-symptoms and the lid-symptoms, and a somewhat irregular heart. Relapses occurred now and then, but in the main steady improvement took place, and was greatly increased, I am inclined to think, by carefully adjusted glasses, immediately after which the exophthalmos materially lessened.

It is interesting to mention that although a distinguished obstetrician, whom I had in consultation with this lady, pronounced it impossible for her to bear a living, healthy child again, yet I subsequently delivered her at term of three fine children, each of which she suckled for a full year, and at the time of the report then given there was no heart-trouble and no goiter. This lady has been under my observation ever since. She has grown stronger year by year, and is to-day a more vigorous person than when first married.

CASE III.—Well-marked Graves' disease; extreme nervousness; cardiac distress; exophthalmos; thyroid enlargement.

Mrs. R., aged thirty-six years, married, with one child, at the age of thirty-four seemed in perfect health. She weighed 130 pounds, and was surrounded by every luxury and care. She had sustained no shock or fright and had suffered no exhausting disease. While sitting in perfect health in a theater she suddenly had, from no known cause, a nervous chill, and from that time her disorder rapidly grew. The chills recurred frequently, changing to what she described as waves of feeling up and down the body. On the slightest exertion a sense of constriction in the chest and sweating of the skin would occur. The bowels were loose; the sleep broken, the woman lying awake for hours with a feeling of deadly fear. She had fallen to 110 pounds in weight, and presented a frightened, restless expression. The eyes were slightly prominent; Von Graefe's sign was present in slight degree; the cornea was injected. The voice and hands were tremulous on movement, and there was a general restlessness of manner. The carotids throbbed and the pulse was from 125 to 135 in the recumbent posture. An irregular, loud, musical murmur was heard in the precordia. The skin was bronzed and glistening, the hands and feet chilly. The enlargement of the thyroid was symmetrical, conveying a thrill to the hand. Some improvement followed rest and tonics. After passing from under my observation she fell into the hands of a gynecic surgeon, and, under a slight operation, suddenly sank and died. No autopsy was allowed.

This case is interesting from the sudden, unexplainable onset, there being literally nothing upon which to place the finger, except the sudden chill,



as stated, and the progression of the disease. The nature of the disturbance was not recognized or treated, and my recollection of the case is quite vivid. The family physician had urged "gentle exercise, simple food, and change of scene." I had an opportunity of seeing the woman for only a very short time, while she was under the care of Dr. Weir Mitchell, who endeavored to do what could be done, but for some reason or other she passed over into the hands of the surgeon, as stated. Persistent careful treatment in the right direction would probably have saved this woman for many years of useful, comfortable life.

CASE IV.—Graves' disease; slight exophthalmos; slight thyroid enlargement; irregular cardiac action; delusions; rapid loss of flesh; began a year previously to lose flesh rapidly during a severe dysentery; aged thirty-nine; had had ten children in rapid succession.

The symptoms present were slight delusions; vertigo; prominent eyes; injected corneal vessels; restlessness of expression; tremor of voice and hands; clammy and glistening skin; dyspnea; thyroid enlargement; noisy musical cardiac murmur; no valvular defect; very emotional; albumin and mucopus in urine. The case was sent to me as convalescent by Dr. Mitchell.

General treatment was pursued, with systematized rest and tonics. The woman gained forty pounds in three months and seemed to be in perfect health, barring a readily disturbed emotional balance and a not yet very vigorous heart. The subsequent history, of which I knew something for many months, was to the effect that this gain was maintained and no relapse occurred to my knowledge, and had it done so, I should almost certainly have known it.

CASE V.—Graves' disease; slight exophthalmos; thyroid enlargement, the neck being fully an inch and a half fuller at the base than normal; slight cardiac disturbance; tremulous voice; recovery; still under observation, and perfectly well.

Miss R., aged twenty-five, presented no neurotic history. One sister has some valvular defect of the heart, but seems now to be fairly well. This patient at ten years of age had enteric fever; at eleven severe dysentery, after which she was long in regaining her health. She had had much headache until the age of nineteen years, when an illness occurred, accompanied by neuralgia in the face and profound prostration. Then she noticed rapid breathing on slight exertion. The eyes were soon remarked as being "curious-looking." She tried to gain strength by exercises in the open air. In March, 1882, she consulted Dr. Seguin, who pronounced the affection Graves' disease and gave an unfavorable prognosis. At that time there was edema of the legs. Digitalis and quiet were ordered. In the following November the woman grew better, after having been partly in bed for several months. In December, 1883, she saw Dr. Gray, of Utica, who also pronounced unfavorably, and relieved an increasing diarrhea. From May, 1881, to May, 1884, the woman menstruated only twice; thereafter irregularly until 1887;

since then she has been fairly regular. Her weight was about 135 pounds; the skin was leaky; the lip and voice tremulous; Von Graefe's sign was present in both eyes; the pupils were normal; the corneal vessels were much injected; the woman flushed readily—a rather unusual feature; she was rarely pale; the heart was tumultuous; there was no valvular defect; the pulse intermitted one beat in three or seven; the thyroid enlargement was symmetric; there was well-marked thrill; a loud bruit could be heard in the right neck; there was subjective buzzing in the back of the head, and frequently a throbbing in the back.

The patient was placed upon systematic treatment with regulated living, digitalis, belladonna, tonics—iron, etc.—and attention to the skin, and for periods of from three to six weeks, two or three times applications of galvanism were made to the thyroid and the heart. The urine was found loaded with uric acid, and simple measures directed to this difficulty always produced marked relief. My report of 1888 goes on to say that the improvement was very marked at that time. The eyes had been examined by Dr. de Schweinitz, who found a slight hypermetropic astigmatism, but no lesion of the fundus.

The subsequent history of this case, which is still under my observation, is, I think, interesting, and consists briefly in a pursuance more or less regularly, of the various measures already described, including galvanism two or three times a year, for periods of from a month to six weeks, and until the last year or two. Instead of the belladonna, I found that hyoscin hydrobromate was a much more useful remedy, and as the strength grew I systematized the use of exercise, both for the eyes, the mind, and the body, and the improvement has been uniform and more rapid of late, and now this lady declares herself to be perfectly well, and nearly as strong as most people. The intermittent action of the heart has almost entirely ceased, although the organ is still irritable. I recently listened to her heart, and there was a beat or two omitted in about 250 or 300 beats. Slight exertion did not seem to increase this, although starting her heart into a more rapid activity than perhaps a normal heart would show. This lady can walk up and down hill for five or six miles without distress—indeed, with comfort. She lives an ordinarily useful life of a single woman of comfortable means. The exophthalmos has entirely disappeared. There is still an excessive injection of the corneal vessels, and the skin has almost regained its tone. A very recent letter describes her condition to be that of a perfectly well and thoroughly happy woman.

CASE VI.—A girl of twenty-four, with a decidedly neurotic family history, and whose mother was queer, presented well-marked Graves' disease. The cause seemed to me to be an attack of dysentery three years previously. This was followed by alarming heart-symptoms, vertigo in sitting or walking, profound weakness, dyspnea, extreme nervousness, poor sleep, sweating skin. There was also much intolerable itching, roaring noises in the head, and edema of the legs. In March, 1886, the thyroid



enlargement was observed; in May the exophthalmos; then developed the full picture of injected sclerotic, puffed lids, bloated face, livid, greasy skin; thyroid enlargement in three directions, mostly on the right. The heart-sounds were clear, with a heaving impulse, and a systolic murmur. The pulse was regular but frequent; the bowels were loose; the voice was tremulous. The eyes, carefully refracted by Dr. Hansell, showed some accommodative defects, but no lesion of the fundus. The urine was albuminous. The patient had pronounced delusions. No improvement has taken place up to date.

This young woman would submit to no regular treatment. She was practically insane when seen, and grew exceedingly religious, and tried to become a nun, but the Sisters rejected her. She fell into a condition that I should judge was one of religious melancholia, although I saw little of the case, except from time to time, learning of it chiefly through her sister. The girl is now in an insane asylum.

CASE VII.—A girl of sixteen, and a sister of Case VI, presented thyroid enlargement, with a very irregular heart, no exophthalmos, a leaky skin, chilly extremities, roaring in the ears. The heart-sounds were quick and feeble; a muffled bruit was heard over the right clavicle and through the thyroid, also a marked thrill. The carotids pulsated visibly. The girl's appearance was pale and cadaverous.

This girl was treated as well as the circumstances would allow, her necessities requiring that she should labor daily for her maintenance. She refused to submit to much treatment, which she pursued irregularly, with steady improvement however. I learn that she is now pretty well. The greatest relief was had from hyoscin hydrobromate, which controlled the nervousness and vascular irregularities.

CASE VIII.—Mrs. S., aged forty-six, presented marked exophthalmos, with pronounced thyroid enlargement, and Von Graefe's sign distinctly. Her trouble began five years previously, after a financial shock and an attack of typhoid fever. The latter was followed by an abscess of the abdomen, and this was opened in two places.

The woman was mentally depressed, had diarrhea, roaring in the ears, irregular menstruation, which soon after the beginning of her trouble ceased altogether. She was strongly built; her skin was muddy and dusky; the left eye was exceedingly prominent, the right less so; Von Graefe's sign was present in both eyes; the carotids throbbed; the heart-sounds were clear, and a distinct slight bruit could be heard; the pulse was irregular and frequent. After eight or nine months of treatment, consisting in the administration of digitalis and iron, and large doses of belladonna, the woman was greatly improved. She is still under my observation. I used so much of systematized measures as her circumstances will allow, but this was not much. The vascular disturbances are best controlled by hyoscin hydrobromate, strychnin and other tonics being occasionally used. The chief feature in her case is mental depression, slight melancholia readily setting in after any unfavorable news or distressing

circumstances, to which, unfortunately, she is frequently subjected. There was, in addition to the trouble described, a considerable catarrhal disorder of the upper air-passages, which received careful treatment. I have seen this patient within a few days, after her return from a trip to Florida, undertaken for her health, and she now seems in all respects a perfectly vigorous, active woman.

CASE IX.—Mrs. J. S., thirty-nine years old; married sixteen years, with no children; a good family history, and of stationary weight; had had headaches of varying intensity all of her life; she has had no serious illness. Menstruation was regular. She suffered with flatulent dyspepsia and irregular bowels, with loose, frequent, slimy stools. Sleep was only fair, being disturbed by bad dreams. The headaches, which had persisted since childhood, were usually relieved by sleeping, and in the morning were localized to the back of the head. This pain was greatly increased on leaning forward, and if this attitude were persisted in, vomiting would often result. The eyes were never comfortable. The woman could not sew or read at night without greatly increased pain. There was also slight lateral nystagmus. The skin was characteristically flabby; frequent flushes were felt; the countenance was anxious; the tongue tremulous and marked by the teeth; there was a vibratile tremor of the voice; the neck was markedly enlarged on the left side; the heart-sounds were feeble and a musical bruit could be heard. The pulse was from 140 to 150 in the sitting posture; its action was irregular. There was great dyspnea on exertion or excitement.

The treatment consisted in the administration of hyoscin hydrobromate, in small dose, every two or three hours, till the skin became drier. Galvanism was applied to the neck, the mode of living regulated, and more rest enjoined. In a week the headache was less than for many years; in two weeks it was entirely gone. Iron was then given with strychnin. In two months the woman was able to resume her labors, and in six months she was scarcely recognizable.

CASE X.—Mrs. S., twenty-four years; married one year, with no children; as an infant was rather weakly. She had scarlatina at ten years of age, and thereafter had a slight swelling of the neck. Her general health then remained good, and at the age of seventeen she weighed one hundred and twenty-eight pounds, and was so circumstanced as to be compelled to do a large amount of hard work on a farm. This necessitated general and prolonged physical exertion, competent observers estimating it as the work ample for three individuals. This was kept up for two years and the woman then began to run steadily down. To the influence of this excessive labor I think may safely be ascribed the development of the malady. For four years this excessive work was kept up and soon afterward she was married. In December, 1889, she had a sharp attack of influenza, with cerebral and laryngeal symptoms. Subsequently marked dyspnea appeared and persisted. Headaches had been a life-long trouble, but six months before coming under observation she had been properly refracted. The

headaches thereafter almost, but not entirely, disappeared. Menstruation was usually regular.

The woman was tall and spare. There was very slight prominence of the eyeball. The skin had a characteristic pasty, leaky look; the hands and feet sweat readily. The heart was rather irregular in action, and a loud systolic murmur was audible over the aorta and the right clavicle; the pulse was 100 and more in the sitting posture. The tongue was clean; the appetite was capricious. Both lobes of the thyroid gland were enlarged.

Galvanic electricity was employed for a fortnight only. Then hyoscin hydrobromate,  $\frac{1}{400}$  gr., was given thrice daily. Rest in bed was enjoined, together with a careful diet. Rapid improvement followed.

At the present writing the woman is in the fifth month of pregnancy, and quite stout and vigorous. The pulse is 85 in the sitting posture. The thyroid enlargement is probably greater than before. Therapeutically, the patient is taking a dry extract of thyroid gland.

CASE XI.—Mrs. N. K. S., thirty-three years old. Her parents are living; her mother suffers with rheumatism, and presents chalky deposits. The family history is otherwise good. The patient is the first child; the labor was normal; she was carefully fed; she had whooping-cough and chicken-pox in infancy, and measles, diphtheria, and pneumonia later. An attack of pink-eye three years ago seems to have injured her myopic eyes. The patient was never robust, convalescing slowly from illnesses. She was always nervous. Two years ago she had a mild attack of chorea. As a schoolgirl she was excitable and easily worried. She menstruated at fifteen, and quite regularly until a year ago; the flow is now rather scanty; six years ago there was amenorrhea, probably from anemia, with swelling of the lymphatic glands on the posterior aspect of the neck. The woman took up teaching seven years ago, and kept it up for five and a half years. Two years ago she had a sharp attack of influenza, which left her in a very nervous condition. She continued teaching, however, for six months, and then was married, about eighteen months ago. She seemed very well then until the spring of 1892, when nervousness set in again, partly as a result of the strain in nursing her ill mother. This caused evil dreams at night, and fear of thunderstorms, etc.; she has been getting gradually more nervous and hysterical; she has never been pregnant.

The patient is a rather small, dark-complexioned woman, the hair streaked with gray, the expression anxious, the eyes prominent, and the pupils responding well to light and in accommodation. She is highly myopic; vision O. D. = 20/cc; O. S. = 20/c. The ophthalmoscopic appearances are not unusual; there is a slight posterior staphyloma. The chest is shallow, the respiratory sounds feeble, the heart irritable. A rapid clanging is audible, but no murmur. A venous hum is heard in the neck, and propagated down the sternum. The thyroid not very large but pulsates visibly; it presents no thrill. The pulse is 100; the skin is very leaky, especially upon the hands, and this condition is aggravated by excite-

ment. The station is good; the gait is irregular. The knee-jerks are exaggerated; there is no clonus. The voice exhibits the characteristic vibratile quality. The treatment consisted in rest in bed; massage; hyoscin hydrobromate, gr.  $\frac{1}{400}$ , four times daily, and increased as needed.

Two weeks later the headache had almost entirely disappeared; the nausea was much more tranquil; the digestion was good; and she was sleeping quietly. She was then taking  $\frac{1}{400}$  hyoscin hydrobromate t. i. d. In the third week the hyoscin was withheld, and a tonic given in the form of elixir of iron, quinin, and strychnin. In the fourth week the woman regarded herself as well; her temperature was normal; she began gradually to sit up. She remained at the hospital forty-three days, and was discharged as cured. She had greatly increased in weight, vigor, and equipoise. The temperature followed the characteristic curve. At the present writing the patient continues well.

#### PRELIMINARY NOTE ON THE EFFECT OF MASSAGE ON THE BLOOD-COUNT.<sup>1</sup>

By JOHN K. MITCHELL, M.D.,  
OF PHILADELPHIA.

WHILE the manipulations of massage have always been said to increase the circulation and promote the movement of blood, it has never, I think, been definitely ascertained what the exact effect upon the blood itself is. In the examination of some recent cases I have had results so startling and so new that I thought them of sufficient interest to justify brief mention to the College to-night, and in advance of the fuller study on which I have already entered.

In the first case, a patient the subject of a very chronic lead-poisoning from drinking-water, with marked anemia, the blood was examined three times before any massage was practised, and the counts were, respectively, 3,725,000 red corpuscles to the c.mm., 4,000,000, and 4,100,000. The percentage of hemoglobin was always the same—a little over 30. On the fourth day careful massage of the abdomen alone was applied, lasting twenty-five minutes. Ten minutes after the ending of the manipulation I examined the blood, and found the red corpuscles 4,500,000, and the white corpuscles, which had previously not been in excess, as 1 to 85 red. The percentage of hemoglobin was not measurably increased. On the fifth day, after general massage lasting one hour, the count showed 6,500,000 red corpuscles, and the same percentage of hemoglobin.

In the second case, a woman from Mississippi, aged forty-two, with a very pallid appearance, decided malarial cachexia, and slight enlargement of the spleen, the first count, made before massage,

<sup>1</sup> From notes read before the College of Physicians of Philadelphia, December 7, 1893.

was 4,700,000, and the hemoglobin 70 per cent. The white corpuscles on this occasion, two hours and a half after the meal, were in the ratio of 1 to 120 red. After one hour's general massage the number of red corpuscles had increased to almost exactly 7,000,000, and the number of white had a ratio of 1 to 38. No further examinations of this case were made on account of the supervention of the patient's menstrual flow.

The third patient, a healthy adult, had a count before massage of 5,675,000, and 110 per cent. of hemoglobin, with no excess of white corpuscles. After massage the red corpuscles were 7,900,000, and the hemoglobin fully 120 per cent. I could not find in this case that there was any excess of white corpuscles, but I had the opportunity of making but one examination, and did not use the only satisfactory method of counting these corpuscles, *i. e.* by a separate examination with a 5 per cent. solution of acetic acid.

The fourth case was one of suspected early locomotor ataxia in an adult male, who, for some weeks had been in hospital under daily massage treatment and quiet, with good food. He had not been rubbed for three days previous to the examination. His count before massage was 6,575,000 red corpuscles, and hemoglobin 110 per cent. At a second examination, on another day, the count was 7,325,000 red corpuscles. On the same day, after massage, he had 7,340,000, a very small increase, and no increase in the amount of hemoglobin.

The fifth case was in a boy of fourteen, who had transverse myelitis, in course of recovery, and had been daily rubbed for some weeks. His count before massage was 6,900,000, with 90 per cent. of hemoglobin, and after massage 8,100,000, with 100 per cent. full of hemoglobin.

I should add that for several of these examinations I am indebted to the kind assistance of Dr. Charles W. Burr, who used a different instrument than mine. They were all made at about the same hour of the day, and, so far as possible, with similar conditions surrounding the patients—a matter of some importance when we recall the great changes that take place in the number of red and white corpuscles in the veins at different hours of the day and in different relations to meal-times. Bernard, indeed, showed that the total amount of blood was so much increased during digestion that an animal could be bled to a greater extent without injury after feeding than before.

This effect of massage does not seem impossible when one recalls how the bloodvessels look when seen in a frog's foot under the microscope. In the lesser capillaries there appears, every now and then, to be a clogging, and, for a time, the corpuscles scarcely

move. When this state is overcome, a like condition is evident in another little vessel. Even in larger vessels, many corpuscles seem not to share in the general movement, and to be temporarily out of the current; the white ones especially cling along the walls, and some of the red ones progress less rapidly than others, or linger for an instant as if they were in an eddy or a side-current; it is probably literally true that there is a "side-current," the serum nearest the walls moving more slowly than that in the central stream. A portion of the blood, therefore—and when the whole capillary system is taken into account, it must be a large portion—is not at all times in active circulation.

It is easy to imagine that the alternate compression and expansion of the veins and arteries during deep massage, and the consequent pumping of blood through them, must push many of the corpuscles that are lingering in the by-ways of the circulation into the full stream of the blood-current, and make a demand upon the various reservoirs and factories of red and white corpuscles for further supplies to take their places.

While, as I said at first, the number of cases is too small to make certain the constancy of this very remarkable change after massage, it seems to me of sufficient importance to justify this imperfect preliminary statement. Even so far as it has gone, it suggests matters of novelty both in physiology and in clinical medicine.

## CLINICAL MEMORANDA.

### A CASE OF COMPRESSION OF THE BRAIN.

BY A. F. HARRINGTON, A.B., M.D.,  
OF WEST POINT, GA.

On the morning of December 26, 1892, I was called to see a negro man, twenty-seven years of age, who at 8 o'clock of the previous night had been struck above the right ear with a stone. I found the patient suffering with a dull headache; there was a contusion of the soft parts above the ear, but I could detect no fracture or depression of the bone. Some dried blood was found in and around the external auditory meatus. The man was perfectly conscious and got out of bed during my visit to void his urine. The only evidence of any paralysis whatever was a very slight difficulty in phonation, and this was hardly perceptible—a little stammering in articulating certain words. The pulse was 64, the temperature normal.

The symptoms pointed to some compression. The areas localized as supplying the larynx were rather anterior to the external injury to the soft parts, yet the existing partial aphonia led me to believe that hemorrhage from a ruptured artery was causing pressure of the speech-center. Being in doubt as to the advisability of trephining I decided to await further developments, ordering a laxative dose of Epsom salts and potassium bromid to quiet restlessness. For four or five days no further symptoms



arose, but the headache still continued. The patient seemed in better spirits and more contented. During this time, without my permission, the man was moved, sitting up in a buggy, to a house one mile away. I was hurriedly called on the morning of January 2d, to find him apparently unconscious, bathed in a profuse and cold perspiration, having convulsions of one minute's duration, occurring every fifteen minutes. During the intermission all of his muscles were tense, the pulse soft, and 125 per minute. The pupils were unequal in size, and irresponsive to light. There was total aphonia, and deglutition was impossible. These symptoms had suddenly made their appearance about 12 o'clock of the previous night, and had rapidly increased in severity. The convulsions occurred more and more frequently, were severer and of longer duration. The man died at 3 o'clock of the same day.

Upon removing the top of the skull, postmortem, I found the inner table fractured at the site of the injury, and a blood-clot two inches in diameter extended forward and upward. All of the meninges were congested. The clot was directly under the bone. The outer table of the skull was perfectly intact.

My sole object in reporting this case is to illustrate the folly of waiting in head-injuries, when symptoms of compression, however slight, exist. I did not operate at once, because I thought the symptoms did not warrant such a radical procedure; when last called no operation was undertaken because the patient was moribund. Whenever there is any compression the symptoms will increase in severity. We cannot expect amelioration unless the cause is removed, and only an operation can do this. Lifting a depressed bone and removing a clot are all that is needed. With antisepsis and due skill the brain can be operated on with impunity. Why then should we allow the formation of a clot to continue until the brain-resistance is overpowered? The surrounding bony wall can never give way—the delicate brain must. Then why not consider *any symptom* of compression an indication for the immediate use of the trephine?

#### THE TREATMENT OF BLEPHARITIS MARGINALIS BY HYDROGEN DIOXID.

By S. C. AYRES, M.D.,  
OF CINCINNATI, OHIO.

The treatment of blepharitis marginalis is often unsatisfactory and disappointing. Relapses frequently occur, and remedies seem to lose their effect, and at times even to act unfavorably. It is true that much of our success depends on the faithfulness of the patient or of his parents in carrying out the treatment at home. Much also depends on the physical condition of the patient, and this should always receive careful attention. Anomalies of refraction seem to play an important rôle in perpetuating the disease, and these also should be carefully corrected. But aside from these considerations, the treatment is often prolonged, taxing the patience of the physician as well as of the client.

The remedies prescribed for the relief of this disease are numerous, and all have met with more or less success. During the past year I have used with great satisfaction hydrogen dioxid in the treatment of this disease.

I was led to its use by some experiments in cases with suppurating rings around the cilia. After removing the crusts and applying the dioxid, there was a bubbling and boiling effect for a while, which soon subsided, leaving the ulcerated surface whitened, as if a solution of silver nitrate had been used upon it. The application was almost painless, and the lid was left clean and free from pus or scales.

These experiments were followed by a general adoption of this method in nearly all cases, but especially in those with ulcerations along the lid-margin. My experience in a large number of cases justifies me in recommending this treatment, so that others may give it a trial. The manner of its application is as follows: The larger crusts should first be removed or scraped off, after having been softened by tepid water. Then a little cotton is wrapped tightly around a Japanese tooth-pick, which is dipped into the dioxid in a little dish. The cotton is then swept over the entire edge of the lid. The characteristic bubbling will follow, and the application is repeated until the bubbling ceases. The ulcers will then present a whitish appearance. If care is taken, and the cotton is not too freely saturated, none will come in contact with the conjunctiva. In order to obviate all pain, a few drops of a 4 per cent. solution of cocain can first be instilled into the eye. This treatment should be repeated every day. The remedy is one that any intelligent person can apply at home, and one from which there is no danger. My experience with the use of salves and ointments is somewhat disappointing. They often cause unaccountable irritation, and on this account are unreliable. In the method advised a clean remedy is used, which acts promptly and efficiently. By its chemic action it destroys the germs which cling so closely to the edges of the lids. It is not a cure-all or a specific, but I certainly have had the happiest results from its use.

#### MEDICAL PROGRESS.

##### *Gastrotomy in a Case of Carcinoma of the Esophagus.*—

At a recent meeting of the Philadelphia Academy of Surgery, KEEN reported the case of a man, forty-eight years old, in which for thirteen months there had been gradually progressive interference with deglutition, so that at the time the patient came under observation he was able to swallow only liquids. The taking of nourishment was followed by a sense of impediment at a point corresponding to the left sterno-clavicular articulation; then the food would pass with comparative ease until it reached a level corresponding to a point half an inch above the lower extremity of the ensiform cartilage. At the latter point distinct obstruction was felt, and the passage of food was attended with darting pain in the median line posteriorly, below the inferior angles of the scapulæ (though more pronounced upon the left), in the epigastric region and in the precordium. Several slight attacks of hematemesis had occurred, and on one occasion quite a considerable loss of blood had taken place. Forty-eight pounds in weight had been lost during thirteen months. There was no history of traumatism, of the ingestion of corrosive substances, of syphilis or of alcoholism. The passage of an esophageal bougie was attended with resistance at a point ten and

a half inches from the teeth, and absolute obstruction was encountered at a distance of twelve inches. It was decided to perform gastrotomy, and the operation selected was that devised by Witzel.

An incision, four inches long, beginning at the middle line and running to the left, a finger's breadth below the border of the ribs, was made, and the fibers of the rectus muscle were separated by the fingers, but not divided. The stomach was seized with two fingers and brought forward and outside the wound, the margins of which were protected with gauze. A rubber tube, five inches in length (size 25, of the French scale for catheters), was introduced into the stomach and infolded by two rows of Lembert sutures. The opening in the stomach was made toward the cardiac extremity, and the tube lay parallel to the external wound, its external extremity emerging near the median line. Three stitches were now inserted into the walls of the stomach, but not tied until the organ was returned to the abdomen, their needles being left threaded. As soon as the stomach was returned these needles were thrust through the abdominal wall and the stomach was brought up to the margin of the opening. The tube was held in place by a catgut stitch passed through the wall of the stomach and through a part of the wall of the tube without obstructing its caliber. About one inch of the tube was thrust into the stomach. The edges of the abdominal opening were now approximated by silk-worm-gut sutures and the ordinary dressing was applied. A clip was placed on the tube to prevent the escape of the contents of the stomach.

The patient made an excellent recovery, without incident, excepting in one respect. On the second day after the operation the dressing became twisted in his movements in bed, and the tube was pulled out of the stomach. In order to replace it, it became necessary to cut three stitches in the external wound. When the tube had been replaced these stitches were re-inserted. Apparently, however, such adhesion had formed that no harm was done by this accident excepting to delay the closure of the wound. After a lapse of six or seven weeks the man began to expectorate some bloody mucus, presumably coming from the ulceration of the carcinoma in the esophagus. He had gained about four pounds in weight. Immediately after the operation he was fed for two days by rectal enemata. Then small amounts of milk were poured into the stomach through the tube. This feeding was gradually increased until the daily food consisted of two quarts of milk, about twenty ounces each of beef, mutton, and chicken broth, and a dozen eggs. This was varied by substituting gruel, thin custard, and other similar food. The man became able to walk about with much comfort. The tube was held in place by a gauze dressing, which in turn was retained by rubber adhesive plaster on each side, laced through eyelet-holes. No escape of the gastric contents took place alongside of the tube.

The patient was still doing well three months after the operation. There was absolutely no leakage whatever.

**Changes in the Blood as a Result of Thermic Influences.** At a recent meeting of the Royal Society of Physicians of Vienna, WINTERITZ (*Wiener medicinische Presse*, 1893, No. 47, p. 1858) reported the results of observa-

tions upon the changes that take place in the blood as a result of applications of heat and cold. He had previously found that the application of cold was followed by an increase in the number of colorless corpuscles in the blood withdrawn from the finger-tip or the lobe of the ear. Fifty additional cases were studied for the purpose of observing the influence of thermic impressions upon the number of red corpuscles, the amount of hemoglobin and the specific gravity. It was found that the employment of general thermic and mechanical measures (friction in cold packs, douches, baths, and the like) involving the entire surface of the body, was attended with an increase of both red and white corpuscles, as well as of the amount of hemoglobin. The maximum increase of red cells reached almost 2,000,000 per cubic millimeter; while the colorless corpuscles were trebled in number, and the hemoglobin was increased 14 per cent. The maximum increase was not always observed immediately after the manipulations, but often after the lapse of an hour. The colorless corpuscles began to increase in number at a time when the red cells were beginning to diminish. These changes lasted a variable time; a diminution could be observed two hours after they had begun. The change in the number of colorless cells was less constant than that in the number of red cells; the former were in some cases both relatively and absolutely in smaller number. In some cases the increase persisted. Active muscular movement had a similar, but less decided effect. General applications of heat were attended with a diminution in the number of red cells, followed by a moderate increase. Applications of cold to the lower extremities were followed by a diminution in the number of both red and colorless cells, in blood obtained from the finger-tip or ear-lobe, while an increase was observed in the blood of the parts to which the applications were made. It was pointed out as unlikely that the increased number of cellular elements is due to their new formation, but as more probable that preëxisting cells are hastened into the blood stream as the result of the application of cold, in consequence of a stimulating and invigorating influence upon the heart, and vessels, and tissues; so that blood previously stagnant in various parts of the body is sent to the lungs and, with a fresh supply of oxygen, becomes capable of renewed function.

**Variations in Weight in Epileptics.**—At a recent meeting of the Society of Biology of Paris, FÉRÉ (*Compt.-rend. hebdomadaire des Séances de la Soc. de Biol.*, 1893, No. 32, p. 891) presented an epileptic who illustrated remarkable changes in weight, such as may often be observed in neuropathic and psychopathic subjects. The patient was a man, thirty-six years old, who had been under observation for seven years, having, as a rule, about six major and three minor attacks a month. During this time he had been generously treated with bromids and with borax, but without avail. Within a period of seven weeks this man gained 2.2 pounds in weight. Then he rapidly put on flesh, gaining 36.3 pounds in the subsequent twenty-six days. Then the man began to lose weight, falling off 2.2 pounds in the course of three days. Throughout the observations the conditions of treatment and diet remained the same.

# THE MEDICAL NEWS.

## A WEEKLY JOURNAL OF MEDICAL SCIENCE.

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SATURDAY, DECEMBER 23, 1893.

### MANNABERG'S THEORY OF LAVERAN'S CRESCENTS.

THE recent monograph of MANNABERG on the parasites of malaria (*Die Malaria-Parasiten, etc.*, by DR. JULIUS MANNABERG, Vienna, 1893) forms a very important landmark in the history of malaria, and should materially assist in the study of that disease. The book combines a fairly full and accurate account of the work of previous investigators with the results of original observation in a rich field, and is embellished with a large number of figures, for the most part colored, which, with few exceptions, are superior to most of those hitherto available. The work deserves, therefore, to be in the hands of all who have to do with malarial disease.

One of the most interesting and important chapters in the book is that in which the author details his theory of the nature of the crescentic body, a theory announced by him a year ago, but not widely disseminated. MANNABERG himself says that more research is needed in order to confirm the theory, but already one writer on the relation of protozoa to disease (*British Medical Journal*, October 14, 1893, p. 825) has treated it as one perfectly demonstrated.

To an investigator uncritical acquiescence is a shade worse than absolute silence, especially when a novel statement is involved. Candid criticism, on

the other hand, is always welcome, and we propose, therefore, to point out briefly some of the more obvious objections to the theory.

A description of the crescents can be omitted here, but before considering the new theory it is well to say that up to this time only one other can claim wide acceptance. This is the theory entertained by MARCHIAFAVA and CELLI, based on observations by those investigators and their pupils, and published in many articles. For convenience we shall call it the Roman theory. According to this the crescents develop from bodies belonging to the form known as the small plasmodium. Beginning as bodies not distinguishable from others of the same kind—that is, as small ameboid intra-corpuseular forms—they tend at an early stage to grow long and narrow, lying along or near one side of the red corpuscle and finally reaching the crescent shape as found in the blood, usually without, but sometimes with traces of the corpuscle in which they grew. According to the Roman investigators the crescents represent sterile forms and do not produce new bodies. It is true that some early observations of the Roman school seemed to show the occurrence of a sort of gemmation, but in all the later investigations stress is laid upon the sterile nature of the bodies, though it is admitted that complete knowledge is still wanting.

MANNABERG's theory is that the crescents are *syzygies* or conjugation-forms. Conjugation, complete or partial, is a process common among all classes of the protozoa, though its details have been worked out only in a few instances and are not always uniform. MANNABERG describes it concisely as a process "in which two or more individuals come in contact and become partially or completely fused. In this the structure of the original bodies disappears more or less; especially do the nuclei tend to disappear. Earlier or later a membrane forms around the conjugate body, by which it is encapsulated or encysted. The further change which these conjugate bodies, known to zoölogists as *syzygies*, undergo is usually sporulation, so that *syzygies* can be looked on as a sort of sexual propagation of the protozoa."

MANNABERG's idea that the crescents represent some such body as that just described is based on the following grounds:

"It is well known that a single red blood-corpuscle may contain two or more of the ameboid organisms. These may be separate, or they may lie



by twos, or, less frequently, by fours, close together. Often the adjacent borders of the two bodies cannot be distinctly seen, especially in fresh blood, and especially if, as is usually the case, the pair lie close to the edge of the blood-corpuscle. The bodies under these circumstances are often long drawn out, and lie with their concave edges to the center of the blood-cell. The length of the body and the fact that the chief part of the plasma is at the poles, make the resemblance of such a pair to a crescent very striking, and all that is necessary to complete the picture is a small number of pigment grains."

Notwithstanding these striking facts, says MANNABERG, it would be too rash to assert that the crescents are syzygies, were it not for the existence of other reasons which actually force that view. These reasons are: the limiting membrane of the crescents, their peculiar structure, the formation and arrangement of their pigment, and their segmentation.

These four points MANNABERG elaborates in a manner interesting, but at a length that makes the reproduction of his arguments impossible here.

Enough has been said, however, to show the ingenuity of the theory, and to indicate how plausible it is. From a biologic point of view much more is involved than the origin of the crescent from one or from two ameboid forms, even if it does not appear that the supposititious syzygies undergo sporulation.

Admitting before going further that future investigation may prove the truth of the theory in its entirety or in part, we wish to set out briefly some of the points which should be borne in mind now and during critical observations.

In the first place it seems to us that MANNABERG in two respects lays too much stress on a membrane. Conjugation-forms do not always become encysted; nor is the presence of a membrane evidence that the body having it is conjugate. So far as the membrane of the crescent is concerned it is quite compatible with the view that the bodies are sterile forms, and also with the view long ago expressed by COUNCILMAN that the crescents are a form of "Dauersporen."

Passing by a consideration of the statements regarding the structure and the pigment of the crescents, we wish to say a word concerning the segmentation of the bodies. MANNABERG speaks of sporulation as one of the functions of syzygies, but by segmentation he means a different process, a

division in ordinary language, which also occurs in conjugation-forms.

According to MANNABERG, segmentation in the case of the crescents consists in a division in the middle in such a way that "before complete division the two halves hang together like a pair of sausages, a part of the pigment being left in each half." From this MANNABERG draws only the nearest conclusion—that is, that the crescents divide—though he suggests that certain dark granules often found in the dividing crescents have some connection with propagation. This process of division MANNABERG says he has seen "not infrequently," and he further says that GRASSI and FELETTI also mention it. But the reference to the work of the latter is so imperfect that it is impossible to verify it. In a later paper by GRASSI and FELETTI (*Centralblatt für Bakteriologie und Parasitenkunde*, Bd. x, No. 15) the following occurs: "We have at times found figures which almost indicated that the crescents divide transversely, and that then each half divides again. At all events we have so far been able to observe indications only of a reproduction of these bodies." On the whole the work of the observers just named does not harmonize with that of MANNABERG.

So far as the division of the crescents is concerned, as MANNABERG figures and describes it, it does not seem to be more than a mere breaking of the body, which from the peculiar structure of the crescents would seem to be very readily brought about. Regarding this point, however, it should be easy to confirm the observation, and one should look, not for partly divided crescents merely, but for the complete division that MANNABERG describes.

Regarding MANNABERG's clinical proofs, we have to criticize one point only, namely, the assertion that the new theory explains the relapses that occur in cases with crescents (strictly speaking, with crescents and small plasmodia). Relapses occur in tertian intermittents without crescents, and although, perhaps, not so frequently as in cases with the small plasmodium, neither MANNABERG nor anyone else has claimed that there are essential differences between the relapses of the two forms. The power of the germs of tertian to remain, as it were, latent for a long time in the body is so well known that it would seem necessary to dispose of it before stating that the conjugation theory is necessary to explain relapses of from two to three weeks, as MANNABERG puts them.

If it is ever demonstrated that the crescents are

syzygies, we shall have a good explanation of certain relapses, but argument in the reverse direction is of little value.

It is hoped that the assertions of MANNABERG will call forth renewed investigation in this interesting subject, and especially is it desirable that this country, which offers such favorable material, will take its part in the work. Though we have been, perhaps, led astray by the remarkable figure of the crescentic body, and so have overestimated its importance, its other remarkable characteristics make it well worthy of investigation.

### SOCIALISM IN MEDICINE.

NATIONALIZATION and centralization have of late made rapid strides in medicine. The position of the physician as a private person is more and more encroached upon, and it is not an idle speculation or theoretic dream to say that if the present methods continue to increase as they have done in the past, the physician of the future will be an officer of the State or of the city, duly appointed and salaried as such. Little by little the work of attending to the sick is being taken up by the community, whether Federal, State, or municipal in nature, by institutions endowed with public moneys or by private or semi-public corporations. The city officials provide vaccination at the public expense, performing in Philadelphia on an average 11,000 a year, and thrice that number in times of epidemics. The Municipal Hospital of the same city is called upon to admit cases of diphtheria, scarlatina, and measles, and during last year's epidemic 183 cases of diphtheria and 159 cases of scarlatina were treated in its wards. With increased facilities a much larger number will be admitted.

The State already possesses six hospitals of its own, not including the hospitals for the insane. These State hospitals are situated in the coal regions and are supposed to care for the injured miners. If the State attends to the health of injured miners, why not have hospitals for the ironworkers, for railroad employes, and finally for tailors, bakers, and all the rest? All are equally entitled to these privileges. Instead of establishing individual institutions, the State endows those already existing; the last legislature appropriated \$200,000 for sixteen Philadelphia hospitals.

There are 35 large hospitals in Philadelphia, having a bed-capacity for 4500 patients, and the

total population of these institutions on September 30, 1892, was 2600. The total receipts of 30 of these hospitals, not including the Philadelphia Hospital and the Municipal Hospital, were, for the year 1892, over \$1,400,000; the total expenditures for the same period were \$1,300,000. Only 20 hospitals received payments from patients, amounting in all to \$160,000; for the rest of their expenses they were dependent on public and private charity. Moreover these institutions are in reality not used by the very poor, who must be crowded into the old Philadelphia Hospital. It is chiefly the middle classes that are admitted, many of them belonging to special religious denominations.

Surgery is mostly carried on in institutions. Formerly the young doctor had a chance of being called to attend an accident-case happening in his neighborhood. Many a physician has won his way into a fair practice through the skill shown in such emergencies. But to-day the patrol-wagon or the ambulance is as speedily obtained as the nearest doctor, and the case is whirled off to the hospital. It is treated in the dispensary if a slight case, or sent to the wards or a private room, according as the financial condition of the patient seems to warrant. We have known rich men to pay \$25 a week for a private room in a general hospital, and demand extra attention of resident and visiting physicians without ever thinking of remunerating one or the other.

Cases of enteric fever, owing to the more complicated treatment, viz., the Brand method, are more and more coming under hospital supervision, and even the young physician is very likely to send his patients to an institution if he finds it difficult to carry out the details of the treatment at home. There were 2300 cases of typhoid fever reported to the Philadelphia Board of Health in the year 1892; and in *THE MEDICAL NEWS* of November 25, 1893, Dr. J. C. WILSON reports seventy-four cases treated at the German Hospital in one year. If other large hospitals show similar statistics we deduce that over one-third of all cases of enteric fever are cared for in public institutions.

Specialism is largely attended to by the dispensary clinics. The eye, ear, nose, and throat departments are always crowded, and usually by the better classes. Costly underwear is not infrequently seen in the gynecologic out-patient departments.

The great rivalry existing between the institutions, and the readiness with which the public is willing

to receive something for nothing, whether in need of it or not, make the free dispensary an object of great abuse. The poor, for whose benefit it is supposed to exist, are crowded and tired out by the more leisurely class, who come early and have nothing to lose by waiting. It cannot be doubted that the dispensary greatly injures the family physician, whose advice was formerly asked for and remunerated by a large number who now regularly attend the special clinics. Even obstetrics is becoming institutional, and the eleven lying-in hospitals and schools of Philadelphia attended in 1892 to 1200 confinements.

But not only in practical medicine is this centralization noticed. Scientific experts are in the employ of the Government and State to study disease and how to prevent it, both at home in laboratories and experiment stations and abroad as Government commissioners. If SURGEON-GENERAL STERNBERG's plan of army and navy medical schools succeeds, may it not be followed by a national medical college at Washington, properly endowed by the Government?

If the State now contributes moneys to medical colleges, why shall it not concern itself about the expenditure of such grants, and hence have a voice in the management? It is but one step further to complete control.

But not only will college hospitals be under Government supervision, but likewise all hospitals if they receive financial aid from the public.

The Philadelphia Hospital suffers greatly from want of space, while elegant monumental buildings, erected to glorify some individual, or set of individuals, beg for State aid, and have many of their beds empty. One hospital asked for \$200,000 of the State Board of Charities to aid in the erection of a new building—a request very properly refused.

The country physician is likewise beginning to suffer from this centralization. The rich, and even middle class, often go to the nearest city in search of medical, and especially surgical advice. The hospitals usually become their resting-place, but having a letter to the hospital surgeon, the latter usually brings in a bill for his services. One prominent surgeon has stated that were it not for such practice referred to him from the country, he could hardly pay his living expenses.

We see, therefore, that while the family physician first suffered from specialism, both he and the specialist are now suffering from institutionalism and

paternalism, and that very soon the only remunerative work in medicine will be that coming from public position, either directly or indirectly. In the meantime the hospital visiting surgeon or physician should demand payment for his services, and if the profession will unite in this demand it must be acceded to, for the hospital cannot exist without the physician.

Private patients should be compelled to pay for medical services, and at clinics and dispensaries some charge for services should be made, except in certain cases. It is as pauperizing to a community to give gratuitous medical service as it is to give free bread.

In every-day practice we are very careful how, by word or deed, we injure the interests of our brethren in the profession. Let us not forget when we become attachés of hospitals that our brother still exists, and that every action of ours countenancing the present indiscriminate methods of squandering medical charities not only greatly injures him, but also pauperizes the recipient and tends to make medicine itself secondary to a board of laymen who receive all the praise and credit.

## EDITORIAL COMMENTS.

*The Neuritis of Diabetes Mellitus.*—Though we do not know the ultimate etiology of diabetes mellitus, the lessons of clinical experience would seem to have demonstrated that the symptoms of the condition are essentially manifestations of a morbid derangement of the bodily metabolism. The obvious inference to be drawn from this assumption is that there is, among other things, either defective disintegration of the saccharine elements of the ingested food, and of those generated within the organism, or excessive production of the latter, perhaps additionally with the retention of certain products of imperfect tissue-change. The seat and the nature of the morbid process are, however, not known. It is true that diabetes mellitus has been observed in association with other morbid processes, such as disease of the nervous system and of the pancreas, but the precise relation between the associated conditions has not been determined. As an indication of the profound consequences to which the derangement of metabolism present in diabetes may lead, beyond the presence of glucose in the urine, we need but point to the coma that determines a fatal issue in a certain proportion of cases. The nutritive depravity is further indicated by the occurrence of various trophic lesions, and by the peculiar susceptibility to tuberculous infection displayed by diabetics. Additional evidence of the circulation in the blood of the toxic products of a perverted metabolism is the occurrence of peripheral neuritis, as manifested by characteristic motor or sensory symptoms. Little attention has been given to this complication, or (perhaps



better) manifestation of diabetes, and not much has been recorded concerning the pathologic changes found in the nervous system after death. In the autumn number of *Brain*, T. DAVIES PRICE makes an interesting contribution to this yet but little traversed field. He reports three cases of diabetes mellitus presenting peripheral neuritis of sensory type, and gives the results of a pathologic study. There were present pains, followed by tingling, numbness, and impaired sensibility, together with ataxia, enfeeblement, followed by abolition of the knee-jerks, but without palsy. In two of the cases perforating ulcers of the feet developed, and in one of these, and in the third, gangrene appeared, leading to fatal termination. In one of the cases the pupillary reactions were enfeebled; in another, a number of otherwise good teeth fell out; one presented lividity, and two an erythematous and edematous condition of the lower extremities. In all three cases there was found, post-mortem, the evidences of parenchymatous inflammation of some of the peripheral nerves, and in one case degenerative changes in the ganglion-cells of the anterior horns of the spinal cord, as well as atheromatous changes in the bloodvessels. We can only interpret these various phenomena to be the result of the presence in the circulation of the toxic products of a deranged metabolism. When we shall have learned more about the influences that induce these morbid derangements we will be in a position to outline a rational therapy or to realize our therapeutic puerility.

*Vivisection of Criminals.*—No more morbid and shameful perversion of the spirit of experimental investigation has been proposed than DR. J. S. PYLE'S "Plea (*Tri-State Medical Journal*, i, 1, p. 5) for the Appropriation of Criminals (convicts?) Condemned to Capital Punishment to the Experimental Physiologist." This inhuman fantasy contemplates nothing less than the removal of the laboratory of experimental psychology to the dungeon of the convict, followed by the ardent psychologist and pseudo-surgeon. The convict is assured that his execution is now placed in the friendly hands of the physiologist, representing the medical profession. This death is to be made to add to the knowledge of man, and secure an advance of the curative art. Having been assured that the execution will be devoid of physical pain and the experiences of the gibbet, the convict is anesthetized, and the whole, or part, of the calvarium is removed. The anesthetic is then arrested; and, after any uncomfortable effects which the drug has produced have passed away, and the convict is again in a normal condition, the various "centers" of the brain are "excited," and the convict being in a peaceful and observing frame of mind, recounts his experiences to the stenographer of the occasion, or runs them on to a phonograph. Then the experiments being ended, the hypodermatic needle is used, and the convict sinks into the long sleep under the "stimulation" of the "center" of greatest physical pleasure.

There are men who deny the right of society to take life at all. There are men who are pained at the presence of medical men at executions, and, especially, at the experiments which notoriety-mongers pretend to undertake; but a very much larger class would protest against any law or laws contemplating such an unholy alliance between the laboratory and the dungeon.

The mere suggestion is revolting, and equally unbecoming a medical man and the medical press. The recommendation shows how little the author has considered the standing of the medical profession in the eyes of the community, the rights of man, the conduct of courts, the value of experiments on animals, and the perspective of the needs of life.

*The Worst Quack Seeks Medical Authority.*—One of the most exasperating and disgusting things about the quack is that in the very same advertisement in which he abuses the medical profession he will in some way claim the sanction or protection of medical science or of reputable medical men. A striking example is furnished by a company hailing from Augusta, Maine, who send out the most astonishing circulars as regards the "cash prizes" gained by their agents, and of the thousands of dollars' worth of "OXIEN" that they are selling. The Company claims the sanction and sails under the certificates of the Mayor, the President of Council, City Solicitor, Postmaster, President of the Board of Aldermen, and all the rest! But in a circular dated November 6, 1893, it is also claimed that the nostrum "is sold under the certificate of the City Physician of Augusta." This struck us as "going too far," and we have before us the letter of the City Physician denying absolutely that he has certified as advertised, or that he knows anything of the cure-all.

As another illustration of the mercantile demands for and uses of "physicians," the following advertisement was clipped from the *Philadelphia Press* of December 11, the year of our Lord, 1893:

"WANTED, A PHYSICIAN to travel with medicine company to lecture; experience not necessary; prefer one who can play organ; a steady, pleasant, and lucrative position offered. Address," etc.

*Decrease of Crime in England.*—The *Lancet* is responsible for the statement that serious crime is steadily decreasing throughout England. It is pointed out that in the five years ending in 1859, when the population of England and Wales was 19,257,000, the sentences to penal servitude numbered 2589, while in the years from 1885 to 1889, in a population of 27,830,179, the number of sentences was 946. Since the last date named a further decrease has taken place. There has also been a remarkable diminution in the number of young convicts. In 1887 this number was 3.2 per cent. of the total; in 1893 it was but 1.2 per cent. These observations agree with the statement that the diminution in the whole amount of imprisoned criminality is mainly attributable to a decrease in the number of young offenders, the proportion of older delinquents having increased. This result may in great measure be ascribed to the steady growth of a tendency, in the case of young persons, to the discipline of reformatory schools. The wisdom of this course can hardly fail to commend itself. Corrective rather than repressive, it embodies the essence of curative treatment as applied to crime. The substitution of fines for imprisonment, the conditional liberation of first offenders and the abolition in many cases of imprisonment for debt are measures of a like tendency, agreed in their purpose of obviating, as far as possible, the necessary evils of prison-life.

**Vascular Pain.**—At a recent meeting of the Association of Physicians, of Vienna, NÖTHNAGEL (*Wiener medicin. Presse*, 1893, No. 46, p. 1819) made the novel suggestion that many of the vague pains so commonly complained of, and which in the absence of demonstrable lesion are ordinarily designated neuralgic, rheumatic, or myalgic, may be dependent upon a disordered state of the walls of the bloodvessels. Thus, in cases in which the symptoms of aneurism later appear, it has been observed that pain was present before compression or involvement of adjacent structures has taken place or distinctive physical signs are recognizable. It is believed that when headache precedes an apoplectic seizure it is indicative of the occurrence of thrombosis, rather than hemorrhage. It is not established, on the one hand, that cerebral ischemia will give rise to pain, or, on the other hand, that cerebral tissue is sensitive, so that the abnormal sensations are to be attributed to changes in the vascular wall. It has been shown that there is a form of migraine dependent upon vascular spasm, and it may be that many of the peripheral pains, sometimes associated also with formication and impaired sensibility, are dependent upon corresponding local spasm. Demonstration is yet wanting that the bloodvessels have a sensory nervous supply, although Pacinian corpuscles have been found in the adventitia of the larger vessels.

**The Four-years' Course of Medical Study.**—The Trustees and Faculty of Rush Medical College have given notice to the Secretary of the American Medical College Association that at the next meeting they will introduce a resolution requiring all students who begin their studies in the fall of 1895 to attend four full courses of lectures in the Medical College of not less than six months each, providing that graduates of all literary and scientific colleges of good standing shall be allowed to graduate in three years, and providing that graduates of dental colleges requiring three full years of study may be allowed to graduate in two years; and that graduates of dental and pharmaceutical colleges requiring only two years of study may be allowed to graduate in three years in the medical college.

Good! But the semester should be, "not less than eight or nine months" instead of "not less than six months." It is no kindness to the lobster to put him in cold water and bring the temperature slowly up to the boiling-point. The more speedily and frankly we accept the inevitable, the better.

**Blindness in England and Wales.**—The agitation directed toward the prevention of ophthalmia neonatorum, in conjunction with the natural advances in medical art, is already bearing good fruit in the reduction in the number of cases of blindness, as indicated by certain statistics quoted in a recent number of the *Lancet*. From these figures it would appear that whilst in 1871 there was in England and Wales one blind person to every 1051, the proportion had in 1891 fallen to one in every 1235. The chief cause of blindness is undoubtedly to be found in ophthalmia neonatorum, and it is probably as a result of the better and earlier treatment of this condition that much of the improvement has taken place. A corresponding improvement is likewise to be observed at other periods of life, and this is to be ascribed

to the general advances made in ophthalmic diagnosis and treatment.

**Increase of Suicide in France.**—A study of the number of suicides in France reveals a most deplorable state of affairs. According to the *Journal Officiel*, during the year 1890 this number reached the formidable figure of 8410 (6576 males and 1834 females). These figures indicate a progressive increase in the number of suicides. In the quinquennial period from 1861 to 1865 the average annual number of suicides was 4661 (12 per 100,000 of the population); while during the period from 1886 to 1890 the average annual number was 8226 (or 21 per 100,000). The proportion of suicides among children under the age of sixteen years has also increased. While in the period from 1871 to 1875 the number was 31, it was in 1886, 62; in 1887, 68; in 1888, 65; in 1889, 77; and in 1890, 80.

## SELECTIONS.

### SUPERFICIALITY AND SELFISHNESS IN THERAPEUTICS.

"IN the work of the younger members of our profession I see, or at least I think that I see, greater care, patience, and accuracy in observation, a more rigorous fidelity in the record of therapeutical experiments, wiser caution in speculation, graver deliberation in judgment, a growing frankness in the confession of oversights and errors, increasing severity in the siftings and testings of their own conclusions, a readier effacement of the personality in the work, less unseemly eagerness for mere priority of publication, a deepened sense of the responsibilities of premature speech and writing, a rapidly abating bitterness in the conflicts of opposing views, a more robust and manlier spirit of scientific life, and less reluctance in making admission that there is no unconditional truth in the results of our inquiries—no finality in our finished work, no creed in medicine. But the Society has done more than train good workers: it has repressed bad workers. For one competent and conscientious worker there are ten who are incompetent and unconscientious, and who in divers ways hinder our progress and spoil our present possessions. Intolerant of the patient and painful toil of the true worker, acute in power of superficial observation, gifted with a certain showy versatility, quick at catching hold of new ideas, ingenious in guessing, crude in experiment, loose in therapeutical trials, hasty in speculation, strong in dogmatic assertions, accomplished in the transfiguration and use of other men's work, finding what they want wherever they seek it, unhindered by difficulties, facile in speech, ready in writing, thirsty for notice—such men, now, alas! not uncommon in medicine, beget papers so quickly that they can have no necessary relation to time, observation, or thought, and flood our literature with their unworthy if not unveracious lucubrations. The favorite hunting-ground for such men is therapeutics, and their favorite sport is the catching of remedies, the putting of them to new uses, and the setting forth of their successful results. These men discern no difficulties and have no failures; they can illustrate their successes by scores of cases, and explain them by the

most ingenious theories. There is scarcely any limit to the extent and variety of their achievements, and as they flaunt along in the fulness of self-satisfaction they look down with pitying condescension upon those in the straight and narrow way who conscientiously toil with small success in seeking after truth, but who, nevertheless, missing the praise of men, find strength and solace in their favored search."—SIR ANDREW CLARK, in the *Boston Medical and Surgical Journal*, November 16, 1893.

#### THE DUTY OF THE PUBLIC TO MEDICINE.

It is interesting to compare the aid extended by the public to theologic and technical education with that granted, for the same purpose, to medicine. According to Dr. Gould, the editor of the Philadelphia *MEDICAL NEWS*, there is, in the United States, a sum of between seventeen and eighteen millions of dollars invested in theologic education, while there is less than half a million invested in medical education. In Ontario, according to the estimates I have in hand, the figures are, respectively, \$2,100,000 and \$85,000. The amount invested in technical education in the United States it is difficult to estimate, but it is undoubtedly a vast sum. In this province the amount given to aid agricultural and mechanical instruction and civil engineering reaches the neighborhood of \$300,000, and this from the State. It may be urged that whatever is given to hospitals should be considered under the head of medical education; but if it could be shown that they always serve that purpose, the contention would be, in some respects, a valid one. But who will contend that this very indirect aid, if it is that, is the equivalent of that granted to instruction in mining, mechanical and civil engineering, and to agricultural education? When millions are given voluntarily by the people to the support of instruction in the various denominational theologies, the State ought surely to presume to give a fraction of such a sum to aid that which is, in the language of the Marquis of Salisbury, "the most sober, the most absolute, the most positive of all the sciences."—PROFESSOR A. B. MACALLUM, Inaugural Lecture, University Medical Faculty, Toronto, October 3, 1893.

### SOCIETY PROCEEDINGS.

#### THE NEW YORK NEUROLOGICAL SOCIETY.

*Stated meeting, held at the New York Academy of Medicine, Tuesday evening, December 5, 1893.*

DR. M. ALLEN STARR, PRESIDENT, IN THE CHAIR.

DR. L. STIEGLITZ presented a young man, twenty-four years old, who three years ago developed a swelling in the right sub-maxillary region. This disappeared in about three weeks, and was replaced by atrophic tissue, a scleroderma. About six months ago the patient began to suffer from spasmodic contractions of the right masseter and platysma muscles, which still continue. It was not believed that the scleroderma and the spasmodic muscular contractions were due to a common cause, although it was conceded that such an association was possible. Dr. Stieglitz was rather inclined to think that the contractions were due to reflex irritation.

DR. FREDERICK PETERSON presented a specimen of "Glio-sarcoma of the Basal Ganglia." The case was that of a man, fifty years old, who had been in excellent health, with the exception of occasional attacks of vertigo and slight headache, until June 8, 1893, when he fell to the floor in his office. He had a general convulsion, and was unconscious for ten hours. In two weeks he was well enough to return to his office from his home in New Jersey, and to continue at work for five days, when headache and malaise kept him at home. Four weeks after his first convulsion he had five or six more of short duration, and rather left-sided in character. At this time he presented the following symptoms: Left hemiparesis and hemianesthesia; left hemianopsia; a tendency to somnolence; pupils equal and small; occasional delirium; great frontal headache; pulse from 52 to 60 per minute; respirations slow; slight optic neuritis. The diagnosis of sarcoma or glioma situated deep in the brain, so as to affect the posterior limb of the right internal capsule, was made. An operation was out of the question. The man was unconscious during the last three days of life. At the autopsy, made just five months after the first apparent onset of symptoms, a glio-sarcoma was found, about two inches in diameter, occupying the region of the basal ganglia, especially posteriorly, and projecting upward into the right lateral ventricle, and downward somewhat into the right crus. It was not strictly circumscribed, and there was some infiltration into the adjacent white matter of the brain, with here and there some areas of softened brain-tissue. A secondary tumor, the size of an almond, was found attached to the dura mater on the right side, compressing the cortex in the region of the angular gyrus.

DR. PETERSON also presented the fresh brain from "A Case of Infantile Cerebral Spastic Diplegia." The patient was a female infant, twenty months old, with congenital diplegia; that is, spastic paralysis of all four extremities. The child was subject to convulsions, and had enormously exaggerated knee-jerks and ankle-clonus. Its head was exceedingly small. At the autopsy the skull bones were found to be considerably thickened, and all the sutures and fontanelles were closed and united. The dura was very thick. There was no increased amount of sub-dural fluid. Over each hemisphere a large group of convolutions, including especially the motor area, were found wanting. The vacuum caused by this atrophy was filled partly by sub-dural fluid and partly by the bulging of each ventricle; there was no internal hydrocephalus. There was no communication between the ventricles and the exterior of the hemispheres. A microscopic examination of the spinal cord showed degeneration and atrophy in the lateral columns.

DR. PETERSON also presented a specimen of "Chronic Hydrocephalus without a Cerebrum." The case was one of a female infant, eighteen months old. Little could be learned of its early history. It had a large head, with widely-gaping fontanelles. The child was blind, and had nystagmus. There was rigidity of all four extremities, occasional convulsions and, toward the last, opisthotonus. The child often cried out at night. Speaking to or moving it caused it to cry out. The pulse was rapid and feeble. The urine contained a trace of albumin. There was no trouble with the bladder or rectal sphincter.



ters. The child could not nurse, and was fed with a dropper. It died suddenly in a convulsion. The temperature never rose above 98° F. while it was under observation. Toward the last the infant vomited occasionally after feeding. At the autopsy, sixty-four ounces of reddish serum were first removed by tapping at the anterior fontanel. The skull was very thin, as was also the dura. The falx cerebri had disappeared. At the base of the brain the basal ganglia stood out prominently, the floor of the lateral ventricles being exposed. The cerebellum appeared to be of normal size. There was a mere vestige of each hemisphere. There was degeneration and atrophy of the lateral columns of the cord.

DR. ALFRED WIENER reported "A Case of Subacute Unilateral Bulbar Palsy, with Autopsy." The patient was a young man, seventeen years old. The family history was negative with respect to any hereditary nervous trouble. The patient had always been in good health up to two years ago, when he was seized with an attack of perityphlitis, from which he recovered after five weeks of illness. More than two years ago the glands on both sides of the neck in the region of the sterno-cleido-mastoid muscles began to enlarge. In the summer of the following year, 1892, an abscess formed in one of these glands and had to be evacuated. In August, 1892, the glands on the right side, together with a large portion of the sterno-cleido-mastoid muscle, were excised. Those on the left side were removed in the following month, and were found to be tuberculous. The patient rapidly recovered, and nothing unusual was noticed until November, 1892, when it was discovered that his tongue deviated to the right side, and shortly after this he experienced some difficulty in swallowing. He soon became hoarse and coughed with difficulty, and within a space of ten days complete unilateral palsy of the right side of the tongue, soft palate, pharynx, and right recurrent laryngeal nerve developed. There was no disturbance of the respiratory or cardiac organs, or other condition present that should have called attention to an affection of any other cranial or spinal nerves than the ninth, tenth, eleventh, and twelfth. The symptoms remained stationary for a time; then the patient began to grow much weaker, and suddenly, on March 26, 1893, he had an attack of respiratory failure. From this he partially recovered, and then continued in a condition of slight respiratory difficulty. He could hardly speak above a whisper. He had excessive salivation. On April 11th he could barely protrude his tongue beyond the edge of his teeth. His lips remained normal, and could be brought into perfect apposition. The palate and pharynx on the left side remained normal. On April 20th the man had another attack of respiratory failure, which proved fatal.

At the autopsy, made six hours after death, the motor cortex, internal capsule, crura cerebri, and pons were found normal. The nucleus of the twelfth nerve on the right side was much diseased, while that on the left side was diseased to but a slight degree. The nuclei of the ninth, tenth, and eleventh nerves were slightly affected, those on the right side a little more so than those on the left. The respiratory bundle of the right side appeared to be completely degenerated, while on the left, in the region of the hypoglossal nucleus, the lower and anterior portions were diseased. In the region of the ninth nerve

a few fibers were affected. The intra-medullary portions of the ninth, tenth, eleventh, and twelfth nerves were less prominent on the right side than on the left. Otherwise everything appeared to be perfectly normal up to the exit of the first cervical nerve from the spinal cord. As regards the nature of the lesion, no tubercle was found, as had been expected, nor were tubercle-bacilli detected on microscopic examination. There was simply an atrophy of the ganglion-cells and fibers which were motor in function.

From a careful consideration of the clinical and pathologic aspects of the case the following conclusions were reached: 1. That the region of the hypoglossal nucleus gives origin to nerve-fibers that supply the tongue, palate, pharynx, and larynx on one side of the body. 2. That the column of nerve-fibers known as the respiratory bundle, consists of fibers from the glosso-pharyngeal, vagus, and vago-accessorium nerves, and that the lower and anterior portion of this column, probably serves as the locality for the vagus and vago-accessorium fibers. 3. That the glosso-pharyngeal nerve seems to control the reflexes of nausea and gagging in the soft palate and pharynx, and also to send some motor filaments to the pharyngeal muscles. These latter filaments take their origin in the hypoglossal nucleus, and ascend in the respiratory column to the nucleus proper, and then make their exit with the glosso-pharyngeal nerve. 4. That the muscles of the soft palate are not innervated by fibers from the seventh nerve.

DR. ROBERT SAFFORD NEWTON read a paper entitled "The Pons-Medulla Flocculus Triangle as a Tumor Site, with Pathologic Findings." He reported the case of a woman, twenty-eight years old, who entered St. Mary's Hospital, July 10, 1893, complaining of constant headache for a fortnight, with morning vomiting and sickness for seven days. There was no history of trauma, and no specific history; the family history was negative. Two days after admission the woman was examined, and apart from a silly manner and a slight drawing in her speech she presented no symptoms. On July 20th the patient became weak and fell to the floor. She muttered to herself during the night and moaned about her head. The pain appeared to be diffuse. She was dull and stupid. Her speech was prolonged and tedious. At this time there was no observable defect of the cranial nerves. The pulse was 45 per minute. The woman had a shuffling walk, with some tendency to go to the right. The superficial reflexes were present, the knee jerk was exaggerated on the right side. On July 22d the patient became quite deaf. The headache was very violent, keeping her awake. On July 24th the patient was very feeble. Deafness was marked, especially in the left ear; there was, however, no tenderness or discharge. The patient stated that she could not see well, but the ophthalmoscope showed no marked lesion. Upon standing up, the patient was projected to the right very forcibly. The movement at each trial was accompanied by a look of fear, pallor of the face, dilatation of the pupils and bathing of the surface in cold perspiration.

From this time on the patient failed rapidly; she grew petulant and childish; her appetite remained fairly good; vision became worse; nystagmus was present for one day only; the external rectus was also temporarily

affected. For a short time there was a transient facial tic. The sense of smell was present to the last. Optic neuritis first appeared in the right eye, then in the left, and rapidly progressed to total blindness. The patient also became totally deaf. Her sense of taste was not appreciably affected, although she occasionally complained of a hot, scalding feeling at the back of the tongue and palate. Her pulse was slow from the beginning; toward the last it dropped to as low as ten, twelve, and fourteen beats per minute, and three days before her death it dropped to six beats per minute. There was no anesthesia or implication of the pain-sense, temperature-sense, tactile-sense, or muscular sense. She never had any convulsive seizures or paralytic attacks. The weakness steadily progressed; there was loss of control of the sphincters; the respirations became slow and gradually ceased. Just before death the woman was still able to distinguish between whiskey and milk.

The autopsy was made ten hours after death. Upon removing the brain an enormous tumor, with a central projection, was found on the left side. The swelling was somewhat triangular; its apex was under the thalamus and geniculate body, its base crowding the cerebellum off from the medulla, and its side line not quite reaching the middle of the pons. In the central pons-region was a projecting mass, shaped like a thumb. The bulk of the growth was a cyst. The left half of the pons was much softened and the medulla and cerebellum were flattened. The olfactory nerve was intact. The optic nerve was swollen on the left side. The third and fourth nerves were intact. The fifth and sixth also seemed to have remained unchanged. The seventh nerve was on one side of the growth, the eighth on the other. The nuclei of the ninth, tenth, and eleventh nerves were pushed aside by the change in position of the floor of the medulla. The nucleus of the twelfth nerve was involved in the growth. The cyst began at the margin of the fourth ventricle, by a blocking of the channel of communication between the lateral cisternæ of the ventricle and the cavity of the arachnoid.

Dr. Newton referred to the natural spaces or reservoirs of the sub-arachnoid fluid that exist in this portion of the brain, and how easily a cystic growth may be developed there; and also to what an enormous size it may attain and what numerous tissues and parts may be invaded, without necessarily giving rise to any localizing symptoms.

DR. CHARLES L. DANA read a paper entitled "Syringomyelia; Central Glioma of the Spinal Cord, with Spontaneous Central Hemorrhage." He narrated the history of a man who had a central gliomatous tumor in the lower part of the dorsal region of the spinal cord. This tumor progressed slowly for two or three years, causing during that time the symptoms of a transverse myelitis chiefly, although the presence of a spinal tumor was suspected. Among other symptoms there was anesthesia of the right leg, extending up to the twelfth dorsal spine, and involving tactile, thermic, and painful sensations. The left leg was also anesthetic, but to a slighter degree. Just before the man's death a large hemorrhage occurred, which was confined to the center of the spinal cord and which caused exquisite pain, the man, in fact, dying from exhaustion. Upon post-mortem examination

a large central hemorrhage, destroying nearly every particle of the spinal cord at the level of the seventh dorsal segment, was found. This hemorrhage extended upward and downward for a distance of about three inches. Around the hemorrhage and above it were evidences of a gliomatous infiltration involving nearly the whole of the transverse area of the cord at that level. Very striking secondary degenerations, ascending and descending, were found. The case was one of glioma of the spinal cord, without the formation of a cavity. Although clinically, and in one sense pathologically, it would be a case of syringomyelia, yet that name cannot strictly be applied to it.

In commenting on this case, Dr. Dana referred to the question of the existence or the non-existence of a pain-tract, and the advisability of searching for it. The psychologists seem to have come to the conclusion that pain is not a sensation, but a form of feeling; that it is not to be classed with the sensations of touch or temperature or heat; that it does not have peripheral end-organs; and that there are no nerves in existence irritation of which alone gives rise to pain; that there is no such thing as a pain-tract; that the attempt to locate such a tract is like the pursuit of a will-o'-wisp. Dr. Dana said that after a very careful study of this question he has been converted to the psychologists' view. If it is claimed that there is a special tract for pain, it can just as well be claimed that there is one for hunger and various other sensations. If there is a special tract for any of the common subjective sensations, there must be special tracts for all.

DR. B. SACHS said that formerly he had held to the view that pain was nothing more than an intensification of the ordinary tactile sense, and in the majority of cases encountered such an explanation would hold good, and under such conditions special pain-tracts should not be looked for. The clinical facts that have been brought out with regard to syringomyelia, however, do not support such a view. Tactile and thermic sense may remain normal, when the pain-sense is entirely lost. The psychologists' view of this question is one that is rather difficult to reconcile with the clinical facts observed in syringomyelia. On the other hand, this disease is very destructive and irregular in course, and for this reason it is rather an unsafe guide in the determination of physiologic functions.

DR. C. A. HERTER said that several years ago he hemisected the spinal cord of a monkey in the mid-dorsal region, and was unable to find in that case any evidence of a loss of sensibility to pain, either on the same side as the lesion, or on the opposite side. He also performed this experiment on an opossum, with a like result. Mott, in his experiments, cut the antero-lateral ascending tract and was unable to find any evidence of loss of sensibility to pain. The results of experiments on animals, of course, cannot be applied directly to man.

DR. LANDON CARTER GRAY said that in the present state of knowledge as regards the exact functions of the various columns of the cord—the columns of Burdach and of Goll, and the so-called column of Gowers and the uncertainty that exists as to the exact demarcation of the latter—no definite conclusions can be arrived at as to the location of the pain-tracts. So far as clinical evidence

goes, there certainly is such a thing as a pain-sense. In hysteria the tactile sense may be preserved, while the pain-sense is entirely lost.

DR. STARR said that the existence of pain-sensations and of a centripetal pain-tract must be admitted. That tract must necessarily pass through the posterior nerve-roots, because painful sensations of a hallucinatory character occur in locomotor ataxia. It must extend for a distance in the central gray matter of the cord. There are now on record over seventy cases of syringomyelia with autopsies. In these cases there has been a decided loss of pain in a certain limb. When the affected limb has been an arm, then the cavity in the cord was in the cervical region, and the pain-sense was preserved on the trunk and in the legs. Therefore these sensations, though they pass for a short distance in the central gray matter of the cord, subsequently pass into the white columns. The central gray matter contains numerous cells, each of which sends its fibers into the antero-lateral columns, and these pass upward. While it is by no means positive that the antero-lateral columns transmit sensations of pain, all of the facts seem to point to the correctness of this view. The column of Lissauer can have nothing to do with the transmission of pain-sensations. It consists only of short fibers, does not increase in size from below upward, and cannot transmit impulses upward for any great distance. The sense of hunger is by no means analogous to the sense of pain. A distinction must be made between a common sensation and a special sensation. In conclusion, Dr. Starr referred to a case reported by Edinger, with autopsy, in which the lesion was found in the parietal region on one side, and in which the symptoms were chiefly those of intense radiating pain on the opposite side of the body.

DR. DANA added that his views regarding the non-existence of a pain-tract were arrived at only after a long and thorough study of the subject. The pain-sense and the touch-sense and the heat-sense, and other forms of sensibility must not be confounded. Pain and touch are entirely different. Pain is a subjective or common sensation. Touch is objective. Pain is much more closely allied to hunger than it is to touch. Pain is not a special sensation, but a modification of it.

## CORRESPONDENCE.

### EFFECT OF METHOD OF CASTRATION ON ANIMALS.

To the Editor of THE MEDICAL NEWS,

SIR: Dr. Goodell's interesting article on "The Effect of Castration on Woman" (MEDICAL NEWS, December 9, 1893) recalls a theory familiar to some horsemen, who claim that in castrating a horse, a short "cord" destroys the life and spirit of the animal. A long one—i. e., one cut as close as possible to the testicle—is more apt to retain these desirable attributes. In view of Dr. Goodell's experience, it is possible that the idea may have some foundation in fact; the retention of the epididymis or perhaps a small portion of the testicle, may be responsible for the great difference in the bearing and action of some of our roadsters.

Respectfully yours,

GEO. H. RHOADS.

TOBYHANNA, MONROE CO., PA.

## NEWS ITEMS.

*The Late Dr. William F. Hutchinson.*—At a meeting of the Executive Council of the American Electro-Therapeutic Association the following resolutions on the death of Dr. William F. Hutchinson, of Providence, R. I., were unanimously adopted:

WHEREAS, It becomes our painful duty to announce the death of Dr. William F. Hutchinson, one of the Foundation Fellows of the American Electro-Therapeutic Association as well as the First-Vice President of the same; and,

Whereas, In his death we lose a warm and faithful friend, a valued associate, and an accomplished member of the profession; therefore be it

*Resolved*, That this Association desires to place on record its appreciation of his genial spirit, his active co-operation in the work of the Association and of his deep interest in the scientific questions relative to his chosen profession.

*Resolved*, That we express our sincere regret and heartfelt sorrow at his death.

*Resolved*, That we tender to his sorrowing family an expression of our profound sympathy in their great loss.

*Resolved*, That a copy of these resolutions be sent to the bereaved family, to the medical journals, and that they be spread upon the minutes of the Association.

*Correction.*—By an inadvertence the word "no" appeared instead of "as" in the fourteenth line from the bottom of the second column of page 662 of THE NEWS of December 9th. The entire sentence should have read: "I subjected the blood to a careful microscopic examination, as malaria had been suggested as the cause of the anemia."

*To Succeed LeFort.*—Duplay has been given charge of the surgical clinic at the Hôtel-Dieu in succession to the late Prof. Le Fort; and Tillaux has succeeded to the surgical clinic at the Charité.

*Professor Rudolf Kaltentbach*, director of the Gynecologic Clinic at Halle, died recently.

### BOOKS AND PAMPHLETS RECEIVED.

The Occurrence of Myopia among School-children. Translated from the German of Dr. Hermann Cohn's work on "Hygiene of the Eyes." By Dr. S. C. Ayres and Prof. J. Remsen Bishop. Reprinted from the American Journal of Ophthalmology, 1893.

A Case of Panophthalmitis, Caused by the Bacillus Coli Communis. By Robert L. Randolph, M.D. Ext. from the American Journal of the Medical Sciences, 1893.

A System of Genito-urinary Diseases, Syphilology, and Dermatology. By Various Authors. Edited by Prince A. Morrow, A.M., M.D. With Illustrations. In three volumes. Vol. II. Syphilology. New York: D. Appleton & Co., 1893.

A Text-book of Physiology. By M. Foster, M.A., M.D., LL.D., F.R.S. With Illustrations. Sixth edition. Part I, comprising Book I: Blood. The Tissues of Movement. The Vascular Mechanism. New York and London: MacMillan & Co., 1893.

One Hundred Operations for Severe Structural Disease of the Abdominal and Pelvic Organs of Women. By I. S. Stone, M.D. Reprinted from the New York Medical Journal, 1893.